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Indian Knowledge Systen and NEP 2020

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Abstract

The Indian education system is undergoing a profound metamorphosis that will completely alter its purpose. Up until now, the education sector has been associated with people's or society's economic interests. The new education policy will give particular attention to necessities in human life. Financial, social, environmental, economic, and cultural factors are among them. By teaching new students how to live a sustainable lifestyle that is in balance with the environment, they will inspire them to become responsible and upstanding members of the community. The goal of India's new education policy is to encourage the next generation to cherish traditional knowledge, which has been lost. These are evaluated in order to assess the strengths and weaknesses of the national policy education framework for India. NEP protection of TK is a great first step toward preserving and advancing indigenous knowledge. However, there are several modern lessons that should be kept in mind when handling such sensitive indigenous knowledge, which is a subset of the umbrella term "Traditional Knowledge."

Keywords: *Indian Knowledge, National Education Policy.*

Introduction

Against the backdrop of the Ministry of Education (MoE) and University Grants Commission (UGC) hosting the three-day Akhila Bharatiya Shiksha Samagam (ABSS) in Varanasi, Uttar Pradesh, starting on July 7,July 4 through July 9. In the new NEP-2020 period, this Varanasi Mahakumbha will spark the exchange of numerous thoughts and experiences from the last two years.The prime minister of India and leader of NEP2020, Shri Narendra Modi, will open this Shiksha Sammelan. The goal of this conference is to evaluate the Indian Knowledge System's (IKS) strengths. This essay makes the case for IKS integration without a distinct identity while maintaining the viewpoint of the current educational system.The only way to uncover Bharat's true nature is to delve into Indian wisdom. Ever before NEP2020 in Indian education was introduced, the Indian Knowledge System, or IKS, has been a main topic of controversy. The primary influential factor in our schooling for the past 200 years has been western viewpoint. In the mainstream of education, knowledge of Indian origin is either disregarded or overlooked. The Indian worldview is completely absent from society. The "meaningful life" is the aim of Indian education, while "living" with "full of means" has become the exclusive purpose of modern education. This shift in focus will continue to be difficult to implement until the Indian Knowledge System is fully integrated into the country's educational system.

Why Do Iks?

Kautilya states that education should strive for the following three qualities in graduates: विद्या - Generation of New Knowledge, विि◌ेक - Prudence in utilizing the appropriate knowledge at the appropriate time and location for the appropriate purpose, as well as विचक्षणता—the skill sets necessary to apply knowledge in the real world. Only when the education system is appropriately balanced and information and skills are integrated in a suitable manner will these results be achievable. The organization of knowledge content, or "what to know," has supplanted the best form of knowledge-seeking "inquiry," or "how to know," in today's educational system. The entire body of Indian knowledge tradition has always placed more emphasis on "how" than "what." Second, the introduction of new technology has thrust humanity into a significant difficulty. There have been serious challenges to human existence. Human instincts are under scrutiny. The Neo educational system needs to properly incorporate new skill sets in order to tackle this challenging circumstance. In addition to having the technological know-how, but it's equally crucial to have the life skills necessary to use the knowledge you acquire. Unequal proficiency in the classroom has harmed the process of knowledge generation. Knowledge without application has led to its demise. The ancient wisdom of India is crucial to this delicate balance. Indian education is now so well-balanced because to the integration of IKS.

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Describe IKS

IKS is the entire body of Indian knowledge that has taken the form of organized modes of knowing. Commencing with the most ancient compilations of knowledge, the Vedic Indian knowledge is widely distributed and ranges from literature to the nation's indigenous and tribal traditions. All of the native Indian languages, in addition to Sanskrit, Pali, and Prakrit, have access to an extensive library of information. The past few decades have seen no investigation into this.Through a systematic classification, Indian knowledge includes the Foundational knowledge, Science, Engineering & Technology, Humanities, and Social Sciences. Over millennia, the Indian Knowledge System (IKS) has undergone changes. It possessesastronomy, ayurveda, and yoga (health and well-being), mathematics and computing, languages and linguistics, metallurgy, rasa-shastra, public administration, and war technology, among many other subjects. Science of Management and many others.Understanding planetary movements, a solar-centric world, the form and diameter of the Earth, the characteristics of plants and herbs, surgical techniques, the discovery of zero, the decimal system of numerals, and Pi approximation algorithms; Panini's universal grammar; the steel-making process; good governance and taxes, and other things?The ancient Indian educational system had eighteen Vidya Sthanas, or schools of learning, which were located in Takshashila, Nalanda, and other learning centers. The fields of philosophy, science, technology, engineering, and art and architecture. India's reputation throughout the world had been built on its practices. This attracted invaders to devastate India as well as students looking to profit. Our nation's strength and wealth came from its knowledge. This knowledge foundation is currently essential for knowledge diplomacy, which will govern international interactions in the future. This is what gives any nation its power. India possesses a wealth of information that has enhanced Indian civilization for thousands of years.

Ways To Include Iks In The Mainstream Of Education?

IKS has been detached from the collective memory for many years, despite being a massive and unbroken reservoir of knowledge. This kind of isolation made IKS, which were perpetuated in Sanskrit and other traditions, inaccessible. Merely reinforcing or revitalizing IKS in the classroom will result in the creation of a new learning compartment that is riskier than preservation.Therefore, a harmonic integration of the IKS content into current understanding is necessary. Such integration necessitates a great deal of work and precision. It is clear from Kautilya's categorization of educational institutions that all modern knowledge streams are connected to the rich legacy of ancient Indian wisdom.

1. Trayii: The three basic sciences, which include the hard and soft sciences, make up the Vijnana-vidya school of science education.
2. Vaarta : is nothing more than commerce, which involves the creation and transfer of wealth via trade and other channels.
3. Danda Neeti - Social studies, political science, state security, and other subjects are taught in schools social or human sciences.
4. Anveekshiki : the science of all learning domains, includes subjects like logic, mathematics, language, and art. Everyone shares this. It is imperative that all students from various academic disciplines participate in these foundational courses. In this instance, novel the education system ought to be integrated with the several IKS branches.

   To put it simply, IKS teaches us how to ask questions. How, exactly? How much?

Our thought process will be directed and reoriented by fundamental sutras. The new worldview that IKS offers is based on the axiomatic belief that "Vasudhaiva Kutumbakam" (the "May all be happy" (Sarve Bhavantu SukhinaH) and "the entire universe is a family"The basic introduction to IKS, its nature and structure, its scope and history, the integration of core IKS concepts into contemporary textbooks, and the creation of Indian Thought Models based on existing information are all included in the integration process. IKS literature and how it's applied to different modern approaches to problem solving.To put it another way, IKS shouldn't be taught only for historical purposes. Rather, it ought to be integrated into the nation's bigger initiatives, such as "Space Science," "Svastha-Bharat," and "Atma-Nirbhar-Bharat." This IKS integrity in mission mode will accomplish the goal. Modal shift "from Preservation to Utilization" will enable us to realise our vision of Bharat as a centre for cutting-edge knowledge.

Indian languages in the classroom (IL)

इदमन्धतमः कृत्स्नंजायेत भुवनत्रयम।्यदद शब्दाह्वयंज्योदतः आसंसारं न दीप्यते। - दण्डी

Life is made brighter by language. The world would be completely dark if there was no "language." The universe is illuminated by the spark of light passed down via words. This proverb from the ancient Sanskrit poet Dandi highlights the significance of language used in Indian philosophy.The basis of human thought processes is language. Without language, it is impossible to "think." Thus, Bhartruhari, the greatest philosopher, says that:

न सोद्त प्रत्सययो लोके यः शब्दानुगमादृते। अनुदवद्धदमव ज्ञानंसवंशब्देन भासते।

Without words, there could be no knowing. Every piece of knowledge is entwined with language.To enable people to think appropriately, a solid foundation is It takes language. As a result, language instruction is regarded as a crucial component of the educational system. Indian languages are extremely important in the context of IKS or IKS-based education. The understanding of fundamental categories leads to an understanding of the IKS. Terms from the Indian language are used to express these fundamental categories of any Indian knowledge system. These concepts' English translation will result in a grave misunderstanding. The IKS education will become weak if Indian Language Education is discontinued. Consequently, Indian education would include a sensible balance of IKS and IL instruction

that encourages.The primary goal of NEP2020, which is to create a comprehensive education system that will enable Bharat to regain its place as the Vishwaguru, will be accomplished with the aid of this integration.

Conclusion

The goal of the New Education Policy 2020 is to include pseudoscience and unscientific theories into courses at universities and schools. under the Indian Knowledge Systems moniker. It is an effort to alter the historical and intellectual narrative about India. The proponents of this approach seek to prove that all civilizations originated in Vedic India. This explains their attempt to forward the Vedic period by a minimum of 10,000 years. To defend the educational system against this assault, the scientific community in particular and all people who enjoy science should organize a movement.

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Ground Water Level Mapping and Analysis of Pre and Post Monsoon Ground Water Fluctuations in Sina River Basin, Maharashtra

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Abstract

Ground water is an important source of fresh water for both domestic and agricultural uses, especially in semi-arid regions where the availability of surface water is very low. Seasonal changes in the levels of ground water are very important for sustainable management of ground water and water resource planning. This research paper is an effort to map and study the ground water levels in the pre monsoon and post monsoon periods of Sina River Basin, Maharashtra, India using GIS techniques. The data of ground water levels collected through observation wells over a period of few years have been used along with spatial interpolation techniques to create ground water level maps for pre and post monsoon seasons. Seasonal ground water fluctuations have been determined through the comparison of pre monsoon and post monsoon ground water levels, which helped in identification of areas where ground water recharges and depletes.

Keywords: *IDW Interpolation, Groundwater Fluctuation, Pre- and Post-Monsoon Groundwater, Sustainable Groundwater Management, Sina River Basin*

Introducation

Groundwater is a comprehensive source of water supply schemes all over the world, especially in rural areas (Nas & Berkatay, 2010) It is one of the most significant freshwater resources supporting domestic, agricultural, and industrial activities, particularly in semi-arid regions of India. In Maharashtra, rapid population growth, expansion of irrigated agriculture, urbanization, and irregular monsoon rainfall have resulted in excessive dependence on groundwater resources. The major sectors that use the groundwater are drinking, domestic, irrigation, and industries (Sajil Kumar et al.,2016) Continuous extraction beyond the recharge capacity has caused considerable decline in groundwater levels in many river basins, including the Sina River basin. Therefore, monitoring and analysis of groundwater fluctuations are essential for sustainable water resource management and planning . (Anand et al. 2020) identified the long-term and spatiotemporal changes in the groundwater levels based on GIS applications in the Lower Bhavani River basin, India.The Sina River basin, a tributary of the Bhima River, lies within the drought-prone region of Maharashtra and experiences frequent water scarcity conditions. The basin is predominantly underlain by Deccan Trap basalt formations where groundwater occurrence depends mainly on weathered, fractured, and jointed zones. Seasonal variation in rainfall and over-extraction of groundwater for irrigation have significantly influenced groundwater level fluctuations in the basin. Groundwater levels were monitored to understand the fluctuation and many along with other studies such as recharge estimation, groundwater quality studies, regional groundwater modeling, surface water interactions, rainfall–recharge relations (Panda et. al. 2007) Understanding the spatial and temporal variation of groundwater levels is therefore necessary for identifying recharge zones, depletion areas, and suitable groundwater management practices.Extensive and continuous usage of groundwater has resulted in the drying up of important aquifers in India (Shah, 2005)In recent years, Geographic Information System (GIS) and Remote Sensing (RS) techniques have become powerful tools for groundwater studies because they provide accurate spatial analysis, data integration, and visualization capabilities. For this study 2010,2015,2020 and 2025 years data used.

Study Area

In this proposed study selected the Sina River Basin. Sina river is the major left tributary of Bhima River. It lies in drought-prone area of Maharashtra. The study region extended from 17°22,43 North Latitude to 19°09'09"North Latitude and 74°43'11" East Longitude to 75°53'48" East Longitude. The total geographical area of the river basin is about 12051.446 sq. Kms. The study area is bounded by Rahuri tehsil of Ahilyanagar district to the north, Beed and Dharashiv districts to the east, Karnataka state to the south and Malshiras and Pandharpur tehsils of Solapur district to the west. In this proposed study we selected the Sina River

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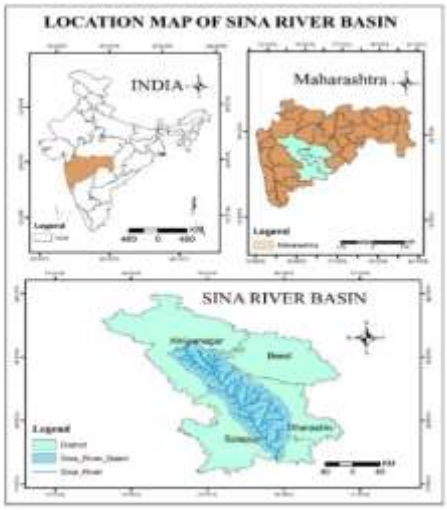

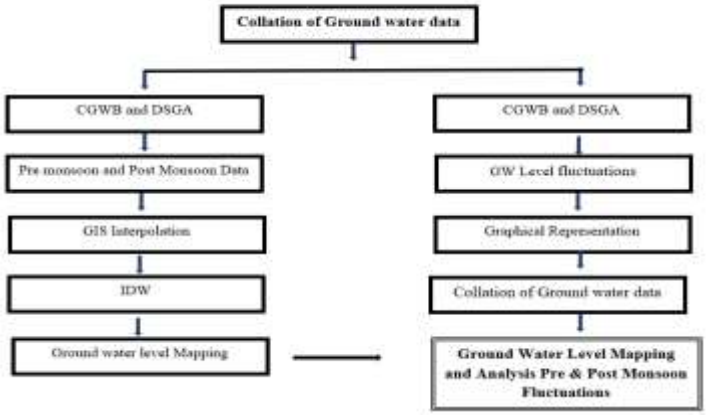

Source: Based on Aster DEM Data

Methodology And Analysis

For Ground water analysis use 2010,2015,2020 and 2025 years Pre and Post Monsoon observation well data

Data used

CGWB and DSGA Observation well data of 2010,2015,2020 and 2025 used for present study

Analysis and Process

Present study Arc GIS 10.5 software used for Ground water Mapping. IDW interpolation method carried out for Ground water mapping. And for the graphical analysis MS Excel used.

Observation Well Data

Data obtained from observation wells were used to analyze the groundwater. Data on ground water level were obtained from two authentic sources ie., Central Ground Water Board (CGWB) and Department of State Groundwater Authority (DSGA). These agencies regularly monitor groundwater conditions throughout the study area with a network of observation wells

Pre-Monsoon Groundwater Level – 2010

In the pre-monsoon season of 2010 groundwater level varied considerably in the Sina River Basin. Orange and red zones (12.83–19.18 mbgl) prevailed in the northwest and central part of the basin which indicated deeper groundwater levels and relatively poor availability of groundwater. These areas may be areas of over-extraction, hard rock terrain or areas with limited recharge.

The southern and southeastern part of the basin was covered by green shades (3.28–9.64 mbgl) depicting shallow groundwater conditions and comparatively better groundwater potential. This suggests that recharge conditions were favorable in these areas due to geomorphology, soil characteristics, or proximity to drainage systems.

Post-Monsoon Groundwater Level – 2010

Post monsoon map of 2010, shows that ground water condition after the rainfall recharge is depicting a significant improvement. The major portion of the basin has shifted in to green and however, some isolated pockets in the northwestern and central parts were in the orange and red classes (5.78–12.18 mbgl), implying inadequate recharge or excessive groundwater exploitation in those places. The reduction in groundwater depth after monsoon clearly shows the positive impact of seasonal rainfall recharge on aquifer conditions in the basin.

Pre-Monsoon Groundwater Level – 2015

The 2015 pre-monsoon groundwater map displays considerable differences when compared with the 2010 map. A large area of the basin is classified as green or yellow (a depth of 2.82 to 9.95 mbgl), which means that the groundwater level is relatively moderate. At the same time, there are some local red and orange areas (ranging from 9.96 to 18.09 mbgl) in the northwestern, central, and southeastern sections of the basin.

Unlike in 2010, nowadays groundwater stress is more widely spread rather than being concentrated in a single area.

Post-Monsoon Groundwater Level – 2015

The 2015 map prepared after the monsoon shows significant recharge in most of the basin, with the majority of the area lying in the green categories (1.74–11.04 mbgl), which shows that the groundwater storage had improved as a result of the monsoon rainfall.

Yet a significant red zone (20.35–24.99 mbgl) is found in the eastern-central area, showing that the groundwater levels are still very deep even after the monsoon recharge.

In the southern area the groundwater conditions are relatively stable and shallow, which indicates a higher efficiency of recharge and a better response of the aquifer.

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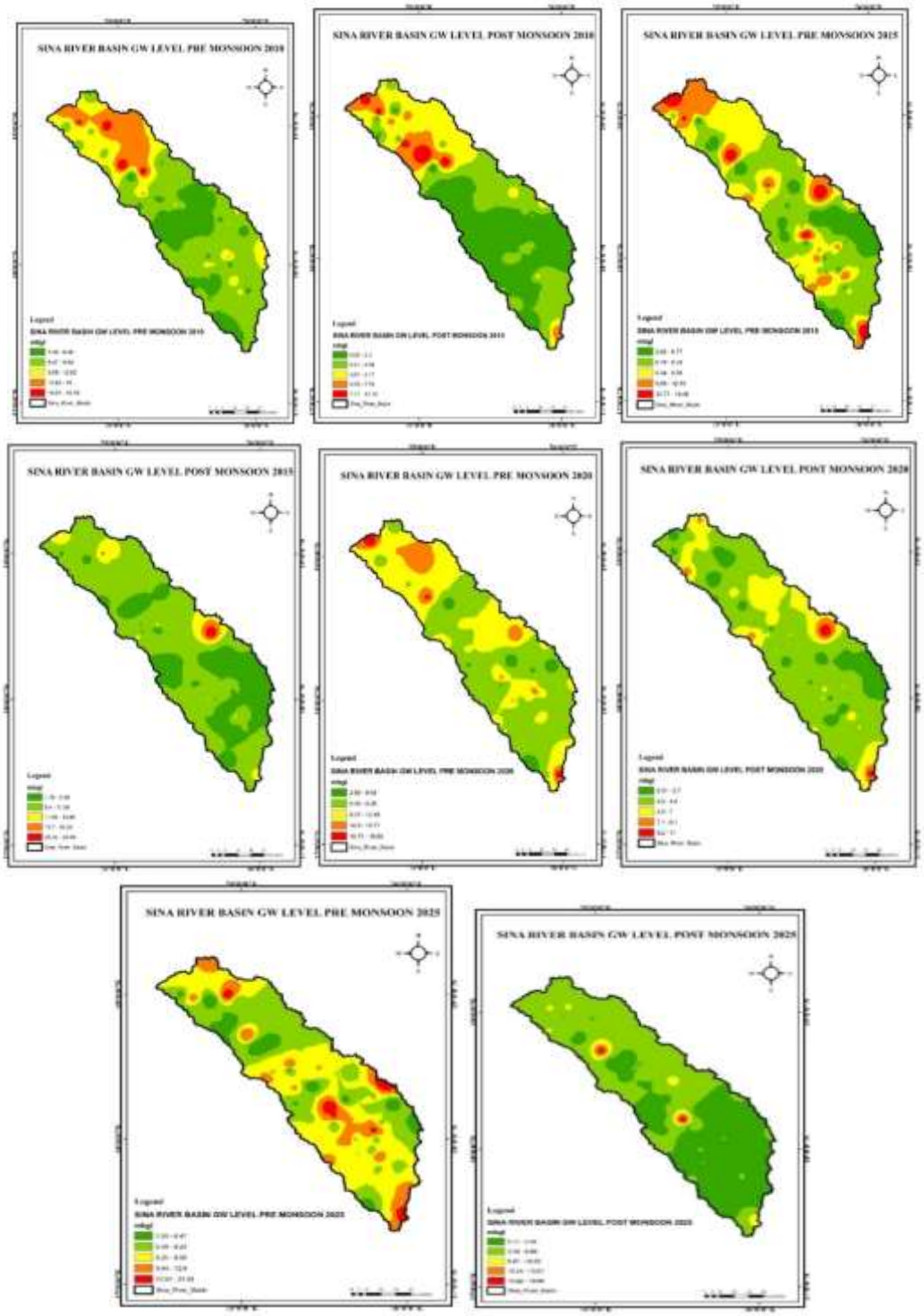

Source: Based on CGWB and GSDA Data

Pre-Monsoon Groundwater Level – 2020

The map of the pre-monsoon groundwater levels in the Sina River Basin for 2020 shows that there was moderate to severe groundwater depletion prior to the arrival of monsoon rains, the depth of the groundwater ranging from 2.82 to 18.93 mbgl.Yellow, orange, and red zones (9.27–18.93 mbgl) cover large parts of the northwestern and central regions of the basin, which means that the groundwater table is deeper and that the availability of groundwater is relatively poor. These areas could be linked with:Prominent red areas in the northwestern region and one in the southeastern tip show that the groundwater is under critical stress conditions.In the central and southeastern parts of the basin the green shades (ranging from 2.82 to 9.26 mbgl) dominate, indicating that the groundwater tables are relatively shallow and that the aquifer conditions are good. It is possible that these areas benefit from better recharge due to surface runoff, infiltration from streams, and the weathering of geological formations.Overall, the 2020 pre-monsoon condition reflects groundwater stress in several parts of the basin due to seasonal depletion and anthropogenic pressure

Post-Monsoon Groundwater Level – 2020

The groundwater map prepared after the 2020 monsoon shows a marked improvement in groundwater conditions as a result of the monsoon recharge. The

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majority of the basin is classified as green (0.51–4.8 mbgl), which means that the groundwater levels are shallow and that there has been effective seasonal recharge. Good conditions for groundwater are especially found in the southern and southeastern areas because of water entering the ground from rain and infiltration from drainage. The groundwater levels in these areas remain deep (4.9–11 mbgl) even after the monsoon recharge period, which indicates that there may be localised groundwater stress, over-extraction, or poor recharge characteristics. A comparison with the conditions that existed before the monsoon shows that the decrease in groundwater depth is a result of the positive effect that monsoonal recharge has on the aquifers in the basin.

Pre-Monsoon Groundwater Level – 2025

The 2025 pre-monsoon groundwater map shows a greater level of groundwater stress when compared with the 2020 map, and the depth of the groundwater varies between 1.08 and 21.59 mbgl, indicating a wider spatial variation.

Post-Monsoon Groundwater Level – 2025

Post-Monsoon groundwater level (2025) map shows that there is considerable recovery of groundwater due to monsoon recharge. Most areas of the basin are shown in green colors (0.11 – 6.86 mbgl) which show shallow groundwater levels and proper conditions for groundwater recharge.Areas shown in dark green colors dominate the southern and central portions of the map, showing that there is proper recharge of groundwater.As compared to the pre-monsoon 2025, there is considerable groundwater recovery.

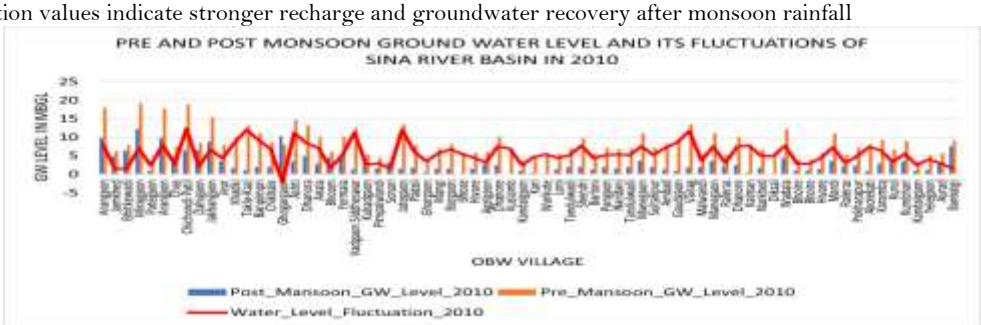
Fluctuation Analysis Of Pre- And Post-Monsoon Groundwater Levels

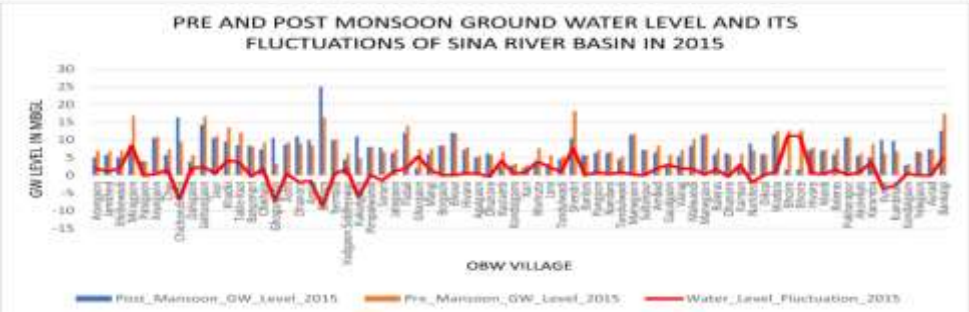
The comparative analysis of pre- and post-monsoon groundwater levels in the Sina River Basin was carried out for the years 2010, 2015, 2020, and 2025 to understand the temporal and seasonal variation in groundwater conditions.

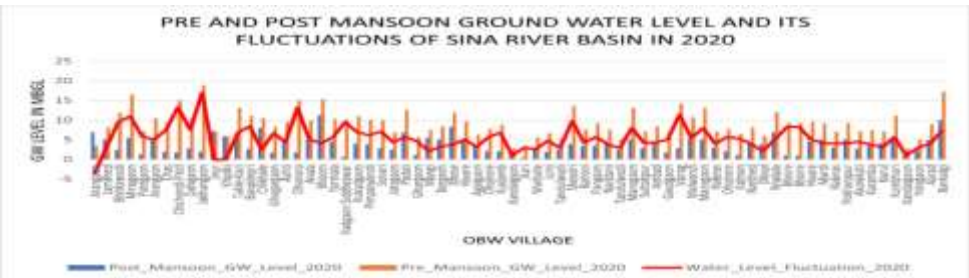
Groundwater fluctuation is calculated using:

GW Fluctuation = Post-monsoon WL-Pre-monsoon W

Higher fluctuation values indicate stronger recharge and groundwater recovery after monsoon rainfall







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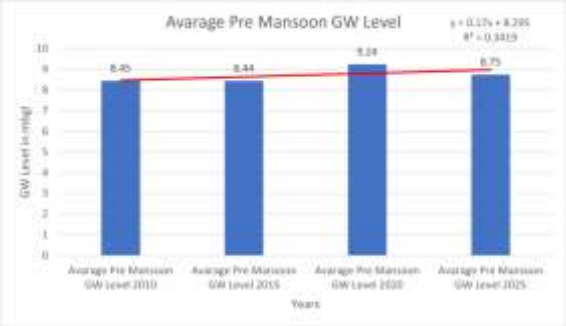
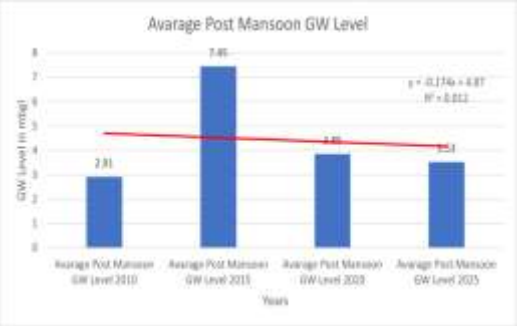
Year	Pre-Monsoon Condition	Post-Monsoon Condition	Overall Observation
2010	Moderate to severe depletion	Significant recharge recovery	Strong seasonal fluctuation
2015	Localized severe depletion	Recharge improved most areas	Persistent stress zones emerged
2020	Moderate depletion	Better recharge conditions	Partial groundwater recovery
2025	Increased groundwater stress	Good recharge but localized depletion	Rising extraction pressure





Conclusion

A comparison study on the levels of groundwater in the Sina River Basin shows that there is considerable seasonality in the variation of groundwater levels, which is highly dependent on monsoonal recharge. Despite the improvement in groundwater levels due to post-monsoon recharge, the increase in pre-monsoon depletion between 2010 and 2025 suggests growing stress on groundwater owing to extensive withdrawals and non-uniformity in the recharging process. Hence, groundwater management practices such as: check dams, percolation tanks, recharge wells, watershed treatment, and groundwater withdrawal regulation are necessary.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Original Article

E-Commerce and Retail Marketing

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Abstract:

The present study examines of the E-commerce and Retail Marketing which is recognized firms to face the contest from the internet that is based on applicants to highlight contributions. With meticulous, the researcher highlights on the retail marketing sector, that is challenged to the domination of customary brokerages. He also enlarges to stylize game; the theoretic model to examine the impact of rivalry between an current full service brokerage firm with a bundled offering of study services as well as deal execution and an online applicant offering just deal effecting. He locates that like customers enthusiasm to pay for the research declines, the incumbent discovers it best to unbundle its offer that competing through internet service. He else come across that the online applicant chooses an inferior quality of trade execution when faced with straight competition from the incumbents unbundled donation.The logical model stimulates an exclusive turf research placing real immediate trades with traditional full-service as well as online brokers, to compare order handling practices and the superiority of deal execution. With the observance, the experiential findings illustrate a significant difference in the excellence of execution between online brokerages and their full-service equivalents. He talks about the significance of results to value delineation, worth junction as well as profit turns down in a diversity of markets wherever conventional present are faced with changes in the spirited countryside as an effect of the e-commerce.

Keywords: *E-commerce, Internet, Retail Marketing.*

Introduction:

The present study highlights on the e-commerce and retail marketing that is well-known full-service firms presenting an extensive variety of commodities as well as services face competition from Web-based entrants with narrower product offerings. With exacting, the researcher learns that the retail brokerage bazaar, that skilled quick enlargement in the divide of online brokers supplying inexpensive deal executions. The trade brokerage signifies the more flourishing applications of e-commerce; for example, the figure of online accounts grew from seven million in the 1998 to above 31 million in 2003, with online brokers dependable to 28% of America trade deal within 2002.

E-commerce:

The word E-commerce is not suitable to apply when it is referred to customer to use of the net for the creating acquire. The customers should not usually refer to carrying out trade when they are acquiring commodities and services in the conventional wisdom of making to acquire in a supermarket. In the earth of the Internet E-commerce typically refers in general to business to commerce type activities rather than customer action. It may be more appropriate to refer to buyer activity in relation to purchasing goods and services on the Internet as on-line shopping. The firmly talking; E-commerce means carrying out transactions electronically, involving sales and purchases over the Internet, during on-line contact points on the Web and in the potential more hence, using digital Television set. Conventional, full-service brokerage firms used to package business execution with associated asset services as well as explore, while online entrants classically focused on trade execution through easy-to-use interfaces that linked entity investors to the trading venues. The radically inferior commissions of online brokers and the huge amount of economic information accessible online. It is also enabled trade investors to ways their own research, drastically abridged the demand of the full-service brokers bundled contributions of research as well as trade execution. The net is extensively qualified with making trade execution more affordable and attractive for retail investors, stimulating the development of the self-directed market segment for brokerage services. As a result, the start of the internet has radically shifted the spirited surroundings by enabling the increase of online brokers, who focused on deal finishing and charged significantly inferior commissions than traditional brokers.A key characteristic of retail store trading is that it is not easy for a distinctive shareholder to prove. But a deal is executed at the most excellent probable value. The same order may be executed at different prices when handled by different firms; hence in adding to the clear commissions they pay, investors face probable costs from differences in execution superiority.

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This cost is concealed, in the sense that the real value of the business and any price development becomes branded only after a deal is executed. Although brokers provide information on which market the trade occurred in, information on the actual superiority of completing compared to what was probable at the time of trading typically is not accessible to investors. The present research work presents one of the first studies of implementation superiority in financial markets based on concurrent trades placed with diverse categories of brokerages. The major findings are mainly important given the difficulty of measuring execution qualities in the retail brokerage bazaar. In contrast to past studies of electronic commerce that focus on price transparency, this research identifies other components of a transaction that are important, in this case, trade quality.It also shows that a unitary focus on price-transparency might mislead, and our findings emphasize the worth of hidden costs and require for better transparency on other dimensions of importance. To finish, the results of the logical model and empirical study donate to sympathetic of developments in other industries where incumbents with bundle contributions are faced with antagonism from online entrants with little-cost component-offerings.

Some Benefits of the E-commerce:

Some benefits of e-commerce are seen as a incentive as well as the use of e-commerce. In the recent time, it is one of the most imperative facets of the net to have emerged. It involves carrying out commerce over the net with the support of computers, which are connected with each-other shaping a system. To be precise e-commerce should be buying as well as selling of commodities and services and relocate of funds through digital communications. It also gives permission to the citizens to carry out commerce without the barriers of time or distance. One more significant benefit of E-commerce is that it is the cheapest means of doing business. The day-to-day pressures of the bazaar have played their part in reducing the opportunities for companies to spend in improving their competitive position. A full-grown bazaar, augmented competitions have all reduced the quantity of currency accessible to invest. If the advertising value may not be increased and the manufactured cost cannot be decreased then the dissimilarity might be in the way the commerce is carried out. It has provided the solution by decimating the costs, which are incurred. The benefits of e-commerce might be measured in the following cases:

1. Abbreviate the moment of transport
2. Worldwide publicity diminish the price
3. Simplicity of communication
4. Price Saving
5. Enlarge the wellbeing level of citizens' life
6. Make easy to contact to worldwide bazaars
7. Amplified alternative for customers
8. Improved effectiveness as well as efficiency in buyer service

Concluding Remarks:

The present research paper is expanded as a model between the E-commerce and retail marketing. The out-comes of the model highlight that under firm circumstances the full-service dealer finds it most favorable to unbundle its offering, and the online entrant chooses to compete with inferior value execution. The experimental study originates that online dealers present inferior quality trade execution. However, it is superior cost to full-service dealers that they are not equalizing through this superiority dissimilarity.

One more use of the e-commerce is that huge curiosity. This is because it is rising significantly more rapidly. It is called to some business the selling as well as advertising commodities or services is finished through computer networks to the net. The results indicate e-business benefits and have imperative trade and industry consequences like expanding the bazaar prices of resources, generate jobs, decrease transaction costs, increasing ease and patience of living in the community and have an important role in financial progress. E-commerce by providing a supply of information and wide access to commerce information has increased the competitiveness of manufacturers in one hand and the other power of customer variety.

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Conflicts of interest

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Original Article

Climate Change and Agricultural Economics in India

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Abstract

Climate change has become one of the most significant challenges affecting agricultural economics in India due to its direct influence on crop production, farm income, resource availability, and rural livelihoods. Agriculture remains the backbone of the Indian economy by contributing approximately 16 to 18 percent to the Gross Domestic Product while supporting the livelihoods of nearly 45 percent of the population. Rising temperatures, irregular monsoon rainfall, frequent droughts, floods, cyclones, and heat waves have increased production risks and reduced agricultural productivity across several regions. These climatic changes have affected major food crops such as rice, wheat, pulses, maize, and oilseeds, leading to fluctuations in market supply and food prices. Small and marginal farmers are particularly vulnerable because of limited access to irrigation, finance, technology, and climate resilient farming practices. Climate variability also influences livestock production, fisheries, horticulture, and agricultural labour productivity, creating wider economic consequences for rural communities. Government initiatives such as the National Mission for Sustainable Agriculture, Pradhan Mantri Fasal Bima Yojana, Pradhan Mantri Krishi Sinchayee Yojana, and climate resilient agricultural technologies developed by the Indian Council of Agricultural Research have strengthened adaptation strategies. Sustainable farming practices including crop diversification, water conservation, precision agriculture, integrated farming, and renewable energy adoption contribute to long term agricultural resilience. Continued investment in agricultural research, rural infrastructure, digital advisory services, institutional credit, and efficient market systems remains essential for reducing climate related risks and ensuring food security. Strengthening policy support, promoting technological innovation, and encouraging sustainable resource management will enhance agricultural productivity, improve farm income, protect natural ecosystems, and support inclusive economic development in India under changing climatic conditions.

Keywords: *Climate Change, Agricultural Economics, Sustainable Agriculture, Food Security, Farm Income, Climate Resilience.*

Introduction

The history of climate change extends over millions of years, during which the Earth's climate naturally changed because of volcanic activity, variations in solar radiation, ocean circulation, and geological processes. However, the nature of climate change changed significantly after the Industrial Revolution in the late eighteenth century, when rapid industrialisation increased the use of coal, oil, and natural gas. The burning of fossil fuels released large quantities of greenhouse gases such as carbon dioxide and methane into the atmosphere, strengthening the greenhouse effect and increasing global temperatures. During the twentieth century, scientific observations confirmed a steady rise in average global temperature, melting glaciers, rising sea levels, and increasing frequency of extreme weather events. International concern led to the establishment of the Intergovernmental Panel on Climate Change in 1988, followed by global agreements including the United Nations Framework Convention on Climate Change in 1992, the Kyoto Protocol in 1997, and the Paris Agreement in 2015. In India, climate change has become an important policy issue because agriculture depends heavily on seasonal rainfall and favourable weather conditions. Rising temperatures, changing monsoon behaviour, frequent droughts, floods, and cyclones have increased the vulnerability of Indian agriculture. As a result, climate adaptation, sustainable farming practices, renewable energy, and environmental conservation have become central components of national agricultural and economic development policies.

Objective Of The Study:

This study explores the Climate Change and Agricultural Economics in India.

Research Methodology:

This study is purely based on secondary data sources such as articles, research papers, journals, websites, books and other sources.

Climate Change and Its Impact on Agricultural Productivity in India

Climate change has emerged as one of the most influential factors affecting agricultural

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productivity in India because the country's farming system depends heavily on climatic conditions such as rainfall, temperature, humidity, and seasonal variations. Nearly 55 percent of India's net sown area continues to depend on rainfall, making millions of farmers vulnerable to climate variability. According to the Ministry of Agriculture and Farmers' Welfare and recent assessments by the Indian Council of Agricultural Research, average temperatures in India have increased by approximately 0.7°C during the twentieth century, while the India Meteorological Department has reported a rising frequency of heat waves and irregular monsoon patterns during the last two decades. Agriculture contributes around 16 to 18 percent of India's Gross Domestic Product while providing livelihood opportunities for nearly 45 percent of the workforce.Since agricultural production forms the foundation of food security and rural employment, any disruption caused by climate change directly influences economic stability. Crops such as rice, wheat, maize, pulses, sugarcane, and oilseeds exhibit varying levels of sensitivity to changing weather conditions. Studies suggest that every 1°C increase in average temperature during the crop growing season may reduce wheat production by approximately 4 to 6 percent in several northern states. Delayed monsoons and uneven rainfall distribution also reduce soil moisture availability, affecting sowing decisions and crop establishment. States including Punjab, Haryana, Uttar Pradesh, Maharashtra, Karnataka, Rajasthan, and Telangana have experienced increasing weather uncertainties that have altered traditional farming calendars.The economic implications of declining agricultural productivity extend beyond individual farms because agriculture supports numerous backward and forward linkages across the Indian economy. Reduced crop yields increase production costs while lowering marketable surplus, thereby reducing farm incomes and weakening rural purchasing power. The Economic Survey of India has repeatedly highlighted the financial vulnerability of small and marginal farmers, who constitute nearly 86 percent of total farm households. These farmers possess limited savings and inadequate irrigation facilities, making adaptation to climate change more difficult. Extreme weather events such as floods, droughts, cyclones, hailstorms, and prolonged dry spells damage standing crops, destroy agricultural infrastructure, and increase borrowing requirements. According to government estimates, drought affected millions of hectares of cropped area during several recent years, while floods in states such as Assam and Bihar caused substantial agricultural losses exceeding several thousand crore rupees. Climate variability also affects labour productivity because prolonged exposure to high temperatures reduces working hours during critical agricultural operations. Livestock productivity declines due to heat stress, reduced fodder availability, and increased disease incidence, further lowering rural household income. Fisheries and horticulture sectors are similarly influenced by changing climatic conditions, leading to fluctuations in production and market prices.

Agricultural economics increasingly recognises climate resilience as an essential component of sustainable development in India. Farmers are gradually adopting climate resilient practices such as drought tolerant seed varieties, improved irrigation systems, crop diversification, integrated farming, precision agriculture, and conservation agriculture. Government initiatives including the National Mission for Sustainable Agriculture, Pradhan Mantri Krishi Sinchayee Yojana, Soil Health Card Scheme, and crop insurance under Pradhan Mantri Fasal Bima Yojana have attempted to reduce climate related production risks. Digital weather forecasting services and mobile based agricultural advisories have improved farmers' ability to make informed decisions regarding sowing, irrigation, and harvesting. The Indian Council of Agricultural Research has developed numerous climate resilient crop varieties capable of tolerating drought, salinity, flooding, and heat stress. Investments in agricultural research, rural infrastructure, water conservation, and renewable energy applications continue to enhance adaptive capacity across different agro climatic regions. Strengthening extension services, improving access to institutional credit, promoting efficient resource utilisation, and encouraging scientific farming practices remain important economic measures for sustaining agricultural productivity under changing climatic conditions.

Climate Change, Farm Income, and Rural Livelihoods in India

Climate change significantly influences farm income and rural livelihoods because agricultural households depend directly on natural resources for their economic well being. Indian agriculture is characterised by fragmented landholdings, seasonal employment, and varying levels of access to irrigation and technology. According to the latest Agricultural Census, the average operational landholding is about 1.08 hectares, making most farmers highly sensitive to production shocks caused by climatic variability. Changes in rainfall timing, increasing temperatures, and frequent extreme weather events reduce crop yields and increase cultivation risks. Lower agricultural production immediately affects household income, savings, consumption, and investment decisions. The National Statistical Office has reported that agriculture remains the principal source of livelihood for millions of rural families, although income diversification through livestock, fisheries, and non farm employment has gradually increased. Climate related production losses force many farmers to rely on informal borrowing, which raises debt burdens and financial insecurity. Seasonal migration from rural to urban areas often increases following repeated crop failures, particularly among landless labourers and marginal farming households. Regions frequently affected by droughts such as parts of Maharashtra, Karnataka, Rajasthan, and Madhya Pradesh have experienced considerable livelihood stress because declining agricultural productivity limits employment opportunities.Climate induced income instability also affects agricultural labour markets and rural consumption patterns. During years of deficient rainfall, farmers reduce labour hiring because lower expected output discourages investment in cultivation. Agricultural wage growth slows while underemployment becomes more common among rural workers. Women, who constitute a substantial share of India's agricultural workforce, face additional economic challenges because they often have limited access to productive resources, institutional credit, and agricultural extension services. Rising temperatures increase irrigation requirements, fuel consumption, and electricity demand, thereby raising production costs. Input prices for fertilisers, seeds, pesticides, and machinery continue to rise, further reducing profitability. Livestock owners face declining milk production due to heat stress and reduced fodder availability, affecting household cash flow. Fisheries and aquaculture also experience productivity fluctuations because changing water temperatures and rainfall patterns alter aquatic ecosystems. According to various government assessments, climate related disasters have caused annual agricultural losses worth thousands of crore rupees,

reducing national agricultural income and affecting food availability. Rural demand for consumer goods, education, healthcare, and housing often weakens when agricultural earnings decline, demonstrating the broader economic impact of climate variability.Enhancing farm income under changing climatic conditions requires integrated economic and institutional interventions. Diversification into horticulture, dairy farming, poultry, fisheries, agro forestry, and value added agricultural enterprises provides additional income sources that reduce dependence on a single crop. Government programmes supporting irrigation expansion, watershed development, rural infrastructure, and market access strengthen the resilience of agricultural households. Farmer Producer Organisations improve bargaining power, reduce transaction costs, and facilitate access to technology, finance, and organised markets. Digital platforms providing weather forecasts, crop advisories, and market price information help farmers make economically efficient decisions. Expansion of micro irrigation through drip and sprinkler systems has improved water use efficiency while reducing production costs in water scarce regions. Promotion of renewable energy technologies such as solar powered irrigation pumps lowers operating expenses and enhances environmental sustainability. Access to affordable institutional credit and effective crop insurance enables farmers to recover more quickly from climate related production losses. Increasing investment in skill development, rural entrepreneurship, agricultural processing industries, and sustainable resource management creates diversified employment opportunities that strengthen rural livelihoods despite increasing climatic uncertainties.

Climate Change, Food Security, and Agricultural Markets in India

Climate change presents major challenges to food security and agricultural markets because fluctuations in agricultural production directly influence food availability, accessibility, affordability, and nutritional outcomes. India is among the world's largest producers of rice, wheat, pulses, milk, fruits, vegetables, and spices, yet its food system remains highly dependent on climatic stability. Rising temperatures, changing rainfall patterns, water scarcity, and frequent natural disasters affect crop yields across different agro climatic zones. According to the Food and Agriculture Organization and national agricultural statistics, India produces more than 330 million tonnes of food grains annually, but production variability caused by climate events creates uncertainty in food supplies. Heat stress during flowering stages significantly reduces grain formation in wheat and rice, while erratic rainfall affects pulse and oilseed production. Water intensive crops grown in regions experiencing groundwater depletion face increasing production risks. Climate induced pest outbreaks and plant diseases also reduce productivity, requiring additional expenditure on crop protection measures. Lower production reduces market arrivals and contributes to fluctuations in wholesale and retail food prices, affecting both producers and consumers.Agricultural markets respond quickly to climate related supply disruptions through changes in prices, trade flows, storage decisions, and consumer behaviour. Reduced production of cereals, vegetables, fruits, and pulses often leads to temporary price increases, influencing household expenditure patterns, especially among low income families. Food inflation has periodically increased during years of poor monsoon performance because supply shortages affect market equilibrium. Higher prices benefit some producers with surplus output but negatively affect consumers and deficit farmers who purchase food from markets. Climate related transportation disruptions caused by floods, cyclones, and damaged infrastructure increase logistics costs and reduce market efficiency. Perishable commodities such as tomatoes, onions, grapes, bananas, and leafy vegetables experience substantial post harvest losses during extreme weather conditions because inadequate cold storage and transportation facilities limit supply chain resilience. Agricultural exports and imports also respond to climate induced production changes. During years of reduced domestic production, export restrictions or increased imports may be implemented to stabilise domestic food prices. Such policy interventions influence agricultural trade balances, farmer incentives, and market expectations. Investment decisions by traders, processors, and agribusiness firms increasingly depend on climate forecasts and production outlooks.Strengthening food security requires climate resilient agricultural systems supported by efficient markets and public policy interventions. Expansion of irrigation infrastructure, scientific storage facilities, cold chain networks, rural roads, and digital agricultural markets enhances supply chain efficiency while reducing post harvest losses. Electronic marketing platforms improve price transparency and facilitate direct transactions between farmers and buyers. The Public Distribution System continues to play an important role in ensuring food access for economically vulnerable households during periods of production instability. Buffer stock management by government agencies helps moderate price volatility and maintain food availability. Climate resilient crop varieties, integrated pest management, improved soil fertility practices, and efficient water management enhance long term production stability. Investment in agricultural research and innovation strengthens productivity despite changing environmental conditions. Promotion of balanced cropping systems and region specific agricultural planning reduces dependence on a limited number of climate sensitive crops. Better coordination among farmers, cooperatives, research institutions, financial organisations, and government agencies contributes to more stable agricultural markets while improving national food security under evolving climatic conditions.

Climate Change Adaptation, Sustainable Agriculture, and Economic Policy in India

Climate change adaptation has become a central component of agricultural economics because long term sustainability depends on the ability of farming systems to adjust to changing environmental conditions. Adaptation involves technological innovation, efficient resource management, institutional support, and policy interventions that reduce climate related production risks. India possesses diverse agro climatic regions ranging from arid deserts to humid coastal ecosystems, requiring location specific adaptation strategies. The Indian Council of Agricultural Research has established climate resilient villages and developed numerous improved crop varieties capable of tolerating drought, floods, salinity, and heat stress. Adoption of conservation agriculture, integrated nutrient management, integrated pest management, agro forestry, and precision farming contributes to improved productivity while conserving natural resources. Water harvesting structures, farm ponds, and micro irrigation systems increase water availability in drought prone areas. Renewable energy technologies, particularly solar irrigation pumps, reduce dependence on conventional fuels while lowering production costs. Sustainable soil management through organic matter addition and balanced fertiliser application improves soil health, enhances water retention

capacity, and increases resilience against climatic variability.Economic policy plays an important role in encouraging climate adaptation by providing incentives for sustainable agricultural practices and reducing financial risks faced by farmers. Public investment in agricultural research, irrigation infrastructure, rural roads, storage facilities, and digital technologies generates long term productivity gains. Government expenditure on agricultural development has increased through various centrally sponsored schemes aimed at improving resilience and resource efficiency. Crop insurance programmes compensate farmers for weather related losses and encourage continued agricultural investment despite production uncertainty. Institutional credit enables farmers to purchase improved seeds, irrigation equipment, machinery, and climate resilient technologies. Financial inclusion through rural banking and self help groups has expanded access to formal credit among small farmers. Agricultural extension services disseminate scientific knowledge regarding climate adaptation, efficient input use, and modern cultivation practices. Carbon efficient farming methods and sustainable land management contribute to reduced greenhouse gas emissions while improving farm profitability. International climate finance and national environmental programmes increasingly support investments in sustainable agriculture and ecosystem restoration.Future agricultural development in India depends upon integrating climate adaptation into economic planning at national, state, and local levels. Strengthening climate information systems enables farmers to make timely production decisions based on reliable weather forecasts. Increased investment in biotechnology, digital agriculture, artificial intelligence based advisory services, remote sensing, and satellite monitoring improves agricultural planning and risk management. Expansion of Farmer Producer Organisations facilitates collective marketing, technology adoption, and resource sharing among smallholders. Public private partnerships encourage innovation in irrigation technologies, climate resilient seeds, renewable energy applications, and post harvest management. Educational programmes that improve farmers' awareness of climate risks and sustainable farming practices strengthen adaptive capacity across rural communities. Sustainable management of forests, wetlands, rivers, and groundwater resources supports agricultural productivity while maintaining ecological balance. Economic policies that promote efficient resource allocation, environmental conservation, technological innovation, and inclusive rural development will continue to enhance the resilience of Indian agriculture against the growing challenges posed by climate change.

Conclusion

Climate change has become one of the defining challenges for India's agricultural economy because it directly influences productivity, farm income, employment, food security, and rural development. Increasing temperatures, erratic rainfall, declining groundwater resources, and frequent extreme weather events have created significant uncertainty for agricultural production across different agro climatic regions. Since a large proportion of Indian farmers operate on small and marginal holdings, their capacity to absorb climate related shocks remains limited, making adaptive strategies an economic necessity rather than an option. The combined efforts of scientific research, technological innovation, improved irrigation, climate resilient crop varieties, and sustainable farming practices have strengthened the resilience of Indian agriculture, but continued investment is essential to address future climatic risks. Government initiatives promoting crop insurance, efficient water management, renewable energy, digital agriculture, and institutional credit have contributed to improving farmers' adaptive capacity and reducing production vulnerabilities. Long term agricultural sustainability depends on balancing economic growth with environmental conservation through efficient resource utilisation and climate responsive policies. Strengthening agricultural research, expanding rural infrastructure, encouraging farmer education, and improving market access will enhance resilience while supporting higher productivity and stable farm incomes. A coordinated approach involving government institutions, research organisations, private stakeholders, and farming communities will be essential for ensuring that Indian agriculture remains productive, competitive, and environmentally sustainable under changing climatic conditions.

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Original Article

The Illusion of Abundance: Choice Overload and Its Impact on Long-Term Romantic Commitment among Modern Youth A Special Perspective on Durjoy Datta

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Abstract

The contemporary world has transformed the meaning and experience of romantic relationships. Young people today encounter an unprecedented number of social, emotional and relational possibilities through digital communication, social networking platforms and changing cultural attitudes towards love and partnership. This apparent abundance of choice is often understood as freedom; however, an excessive number of alternatives can also create uncertainty, dissatisfaction and difficulty in making long-term commitments. The present paper examines the phenomenon of choice overload and its possible impact on romantic commitment among modern youth. The study draws upon psychological theories of decision-making, particularly the concept of the "paradox of choice," and applies these ideas to contemporary romantic relationships. Sheena Iyengar and Mark Lepper's research demonstrates that an excessive number of alternatives can sometimes reduce motivation and satisfaction, while Barry Schwartz's work explains how unlimited options can generate anxiety, regret and unrealistic expectations. These concepts become particularly relevant in the digital age, where relationships may be approached through an environment of apparently unlimited alternatives.The paper further examines the literary representation of contemporary love in the works of Indian popular novelist Durjoy Datta. His novels frequently portray young characters negotiating attraction, emotional uncertainty, separation, reconciliation, expectations and changing definitions of love. Of Course I Love You..., Hold My Hand, If It's Not Forever... It's Not Love, When Only Love Remains, The Girl of My Dreams, The Boy Who Loved, The Boy with the Broken Heart and The Perfect Us provide useful literary contexts for examining how contemporary romantic relationships encounter emotional instability and the desire for permanence. Datta's fiction does not simply present love as an uncomplicated romantic ideal; instead, his narratives often place relationships under pressure from individual desires, misunderstandings, social expectations and personal choices.The paper argues that the problem faced by modern youth is not merely the availability of more potential partners but the psychological transformation of relationships into a continuous process of comparison. When individuals believe that a better alternative is always available, commitment can become difficult because every relationship appears provisional. The illusion of abundance may therefore produce dissatisfaction even when a meaningful relationship already exists. At the same time, the paper avoids treating technology or young people themselves as the sole cause of declining commitment. Personal maturity, communication, social expectations, economic circumstances, family structures and individual values also influence relationships. The literary perspective of Durjoy Datta is valuable because his fiction reflects the emotional vocabulary of a generation negotiating between romantic idealism and contemporary uncertainty. Ultimately, the paper suggests that meaningful commitment requires not the elimination of choice but the development of the ability to make conscious, responsible and emotionally mature choices.

Keywords: *Choice Overload; Romantic Commitment; Modern Youth; Digital Relationships; Durjoy Datta*

Introduction

Love has always been an important subject of literature, philosophy and social thought. However, the experience of romantic relationships has changed considerably with the development of modern communication technologies and changing social values. Earlier generations often encountered potential partners through relatively limited social circles such as family, neighbourhood, educational institutions and workplaces. Modern young people, by contrast, live within a highly connected social environment in which communication can extend far beyond immediate geographical and social boundaries. This expansion appears liberating. Individuals have greater opportunities to meet people with different personalities, interests, educational backgrounds and cultural experiences. Yet freedom of choice can produce an unexpected psychological problem: too many alternatives may make choosing more difficult.

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The concept of choice overload provides an important framework for understanding this situation. Choice overload refers to the difficulty, dissatisfaction or indecision that may emerge when individuals face an excessive number of alternatives. Sheena Iyengar and Mark Lepper's influential 2000 study challenged the assumption that more choice is always better. Their experiments demonstrated that participants sometimes responded more positively when presented with a limited selection than with a very large assortment.Barry Schwartz later popularized the broader social implications of this phenomenon in The Paradox of Choice: Why More Is Less. Schwartz argues that excessive choice can increase expectations, encourage comparison and generate regret about decisions already made.These ideas become especially interesting when applied to romantic relationships. A romantic relationship is not simply a consumer decision. A person cannot objectively compare human beings as though they were products. Nevertheless, digital culture can sometimes encourage people to think about relationships through comparison, evaluation and constant availability of alternatives. The result may be an illusion: the belief that because there are many possible alternatives, there must necessarily be a perfect alternative somewhere.This paper examines how that illusion can influence long-term commitment among modern youth and how Indian popular fiction, particularly the novels of Durjoy Datta, represents the emotional difficulties associated with contemporary love.

Understanding the Concept of Choice Overload

Choice is generally associated with freedom. Being able to choose one's education, career, lifestyle and relationships is an important feature of modern individual autonomy. Choice allows people to move beyond rigid social expectations and make decisions according to personal preferences.However, choice has a psychological limit.Iyengar and Lepper's research is important because it questions the simple equation between more alternatives and greater satisfaction. In their experiments, participants sometimes demonstrated greater interest and satisfaction when confronted with a smaller number of options than with a larger assortment.The same principle can be understood metaphorically in romantic life. When a person believes that there are countless possibilities, selecting one individual may feel like giving up all the others. The decision therefore becomes psychologically expensive.Barry Schwartz describes a related distinction between people who try to maximize their decisions and those who are willing to choose an option that satisfies their important requirements. Excessive comparison can produce dissatisfaction because the individual continues to imagine alternatives even after making a decision.

In romantic relationships, this can create questions such as:

Is this person really the best possible partner?
Could someone more compatible appear later?
Am I settling?
What if another relationship would make me happier?
Should I continue searching rather than investing in the present relationship?

These questions are not necessarily harmful by themselves. Healthy reflection is an important part of relationships. The problem emerges when comparison becomes endless and prevents emotional investment.

From Romantic Choice to Romantic Consumerism

Modern digital culture has introduced new ways of encountering people. Social networking platforms and online dating environments have expanded the social field in which relationships may begin. Research on online dating has demonstrated that digital platforms create large and measurable relationship markets in which users encounter many potential partners.

This can change the psychological meaning of romance.

A relationship may gradually begin to resemble a process of selection. Individuals may concentrate heavily on visible characteristics such as appearance, education, profession, interests or social presentation. The person is then evaluated according to a list of preferences.

Such evaluation can create the impression that compatibility can be calculated.

But long-term relationships depend on qualities that are difficult to measure at the beginning: patience, emotional responsibility, communication, trust, empathy, willingness to compromise and the capacity to grow together.

Therefore, the abundance of options can produce an important paradox. A person may have more opportunities to meet others but less willingness to invest deeply in one relationship.

The abundance of possibilities can also increase the fear of making the wrong decision. A person who believes that a better alternative is always available may find it difficult to accept the ordinary imperfections of an existing relationship.

The Illusion of the "Perfect" Partner

One of the most important consequences of choice overload is the creation of unrealistic expectations.

When people encounter numerous alternatives, they may begin to imagine that somewhere there exists an ideal option satisfying every requirement. In romantic culture, this can become the fantasy of the "perfect partner."

However, real relationships are rarely perfect. Every individual has strengths and weaknesses, and every long-term relationship experiences disagreements and periods of adjustment.

The pursuit of perfection can therefore become an obstacle to commitment.

This does not mean that young people should remain in unhealthy relationships. Commitment should never be confused with tolerating disrespect, manipulation or

serious incompatibility. Rather, the issue concerns relationships that are reasonably healthy but are abandoned because the individual constantly imagines that something better must exist.

Schwartz's analysis is relevant here because excessive choice can increase the psychological cost of decisions and produce regret even after a satisfactory choice has been made.

Thus, the problem is not necessarily that modern youth have too many romantic opportunities. The deeper issue is the belief that more alternatives automatically guarantee a better emotional outcome.

Impact on Long-Term Romantic Commitment

Commitment requires a psychological movement from possibility to decision.

At the beginning of a relationship, uncertainty is natural. Individuals are learning about each other. Over time, however, a stable relationship requires trust and investment. If one constantly evaluates alternative possibilities, emotional investment may remain incomplete.

Choice overload can affect commitment in several ways.

Indecision

An individual may delay making a serious commitment because every decision seems reversible. The person may fear that choosing one relationship means losing access to potentially better alternatives.

5.2 Comparison

Continuous comparison can make an ordinary relationship appear inadequate. Instead of appreciating the actual relationship, the individual compares it with imagined alternatives.

Unrealistic Expectations

Exposure to idealized representations of romance may lead young people to expect constant excitement, perfect compatibility and uninterrupted happiness.

Fear of Missing Out

The psychological fear that another opportunity may be better can make people hesitant to commit. The relationship becomes provisional rather than permanent.

5.5 Emotional Fatigue

Constant evaluation can become mentally exhausting. The individual may eventually experience frustration not because relationships are impossible, but because choosing and maintaining relationships has become psychologically complicated.

Digital Culture and the New Romantic Environment

The digital environment has not simply created problems. It has also provided important opportunities.

People who previously found it difficult to meet others because of geographical, cultural or social restrictions can now communicate across wider communities. Digital communication can help people find individuals with shared interests and values.

The difficulty lies in the structure of abundance.

A digital environment may continuously present new possibilities. This can encourage the belief that relationships should always remain open to replacement.

Recent research and commentary concerning dating-app use have also raised questions about whether excessive platform engagement can encourage shallow interactions, unrealistic expectations and dissatisfaction.

However, it would be inaccurate to claim that technology automatically destroys commitment. Relationships are shaped by many factors, including personality, communication, social environment and individual values.

Therefore, the argument of this paper is not anti-technology. Instead, it questions the psychological habit of treating human relationships as an endless marketplace of alternatives.

Durjoy Datta and Contemporary Indian Romantic Fiction

Durjoy Datta occupies an important position in contemporary Indian popular fiction because many of his novels focus on young people, love, friendship, emotional conflict and the uncertainty of modern relationships. Penguin Random House India describes him as the author of numerous bestselling romance novels, including Of Course I Love You..., If It's Not Forever..., Till the Last Breath..., Hold My Hand, When Only Love Remains, The Girl of My Dreams, The Boy Who Loved, The Boy with the Broken Heart and The Perfect Us.

His popularity makes his fiction particularly useful for examining the emotional vocabulary of contemporary Indian youth.

Datta's fiction frequently presents love as a relationship involving attraction, misunderstanding, conflict, separation and emotional transformation. His characters are not simply representatives of traditional romantic ideals. They often struggle with personal desires and the practical difficulties of sustaining relationships.

His first novel, Of Course I Love You..., is particularly relevant to this discussion. The story of Debashish presents a young protagonist whose relationships are unstable and whose emotional development becomes connected with the consequences of his choices. Penguin's description emphasizes the character's short-lived relationships, breakup and subsequent emotional crisis.

The novel can therefore be read as an early representation of the instability of contemporary romantic culture.

Of Course I Love You..." and the Problem of Temporary Relationships

Of Course I Love You... presents a young protagonist whose early relationships are characterized by instability. His romantic experiences demonstrate the difference between attraction and emotional maturity.

The novel becomes significant in the context of choice overload because the title itself contains a contradiction between love and replaceability. The idea of loving someone "until" another person appears suggests a model of affection in which commitment is conditional.

This does not necessarily mean that Datta personally advocates such behaviour. Instead, the novel can be interpreted as exposing the instability of a young person who has not yet developed a mature understanding of commitment.

The movement from attraction to emotional consequence is important. The protagonist's experiences demonstrate that romantic freedom without emotional responsibility can produce loneliness and confusion.

In this sense, Datta's early fiction can be read as a critique of immature romantic choice rather than simply a celebration of romance.

Hold My Hand: Love, Difference and Emotional Investment

Hold My Hand offers another perspective on contemporary romance. The novel follows Deep, a young man who travels to Hong Kong and meets Ahana, a blind young woman. Their relationship develops through shared experiences, but the return of Ahana's former boyfriend introduces emotional complications.

The novel is relevant to the present study because it demonstrates that relationships cannot be reduced to a simple comparison of desirable characteristics.

Deep's relationship with Ahana involves communication, experience and emotional understanding. The story therefore shifts attention from superficial choice towards emotional connection.

The presence of an earlier relationship also demonstrates that romantic history complicates the idea of choosing a

Datta's fictional world frequently places love alongside circumstances that test relationships. Such situations challenge the idea that romantic commitment can survive through attraction alone.

Long-term commitment becomes meaningful when individuals remain emotionally engaged despite difficulties.

This is especially important in relation to choice overload. When alternatives are constantly imagined, difficulty may encourage people to leave rather than repair a relationship. Yet emotional maturity often requires the ability to distinguish between a relationship that is genuinely unhealthy and a relationship that is simply experiencing ordinary difficulties.

This distinction is essential. Commitment does not mean remaining in every relationship indefinitely. Rather, it means taking an existing relationship seriously enough to communicate, understand and make responsible decisions.

The Girl of My Dreams and the Relationship Between Reality and Imagination

partner. People do not enter relationships without memories, expectations and previous experiences.

Commitment, therefore, is not merely about selecting the "best" person. It involves understanding another person's individuality and developing trust through shared experience.

If It's Not Forever... It's Not Love: Permanence and the Meaning of Commitment

The title If It's Not Forever... It's Not Love directly introduces the question of permanence.

The title can be interpreted as expressing a traditional romantic desire for lasting commitment. At the same time, it raises an important question: can love be defined solely by its duration?

Contemporary relationships often exist between two opposing expectations. On one side is the desire for emotional freedom; on the other is the desire for permanence.

The tension between these two ideas is central to modern romantic culture.

A relationship requires freedom because two individuals must retain their identities. But commitment requires a degree of stability and responsibility. The challenge is to balance autonomy with emotional investment.

Datta's fiction repeatedly returns to this tension, making his work useful for examining how young people negotiate the conflict between romantic desire and long-term responsibility.

When Only Love Remains and Emotional Permanence

When Only Love Remains further illustrates the emotional intensity associated with contemporary romance.

The title The Girl of My Dreams itself reflects the powerful role of imagination in romantic life.

Modern romantic culture is increasingly influenced by imagined versions of relationships. Social media, films, literature and online representations can create idealized images of romance.

Datta's fiction often explores the gap between what characters imagine and what they actually experience.

This distinction is crucial to understanding choice overload. If young people compare real individuals with imaginary perfection, almost every real relationship may appear inadequate.

A person may therefore reject meaningful emotional connections because they do not perfectly resemble an imagined romantic ideal.

The problem is not dreaming about love. Imagination is an important part of human emotional life. The problem begins when imagination becomes the standard against which every real relationship is judged.

The Boy Who Loved and the Emotional Cost of Love

The Boy Who Loved can be examined through the theme of emotional vulnerability.

Love involves uncertainty because another person cannot be completely controlled or predicted. A person who wants complete certainty may avoid emotional investment altogether.

Modern choice culture can strengthen this tendency. If individuals believe they can always find another alternative, emotional risk may appear unnecessary.

But emotional intimacy requires vulnerability. A person cannot develop deep trust without accepting some degree of uncertainty.

Datta's representation of young love is valuable because it frequently focuses on this emotional vulnerability. His characters experience love not simply as pleasure but as something capable of changing their understanding of themselves.

The Boy with the Broken Heart: Loss and the Limits of Choice

The idea of a "broken heart" represents one of the most familiar themes in romantic fiction. However, from the perspective of choice overload, emotional loss can be understood differently.

If relationships are treated as replaceable, emotional attachment may appear irrational. Yet human beings often become deeply connected to particular individuals.

This shows the limitation of treating romantic relationships as a marketplace.

A person cannot simply replace emotional history by selecting another alternative. Shared memories, trust and personal development create a unique relationship that cannot be replicated through an identical "choice."

Datta's romantic fiction therefore provides an interesting contrast to the logic of unlimited alternatives. His characters often demonstrate that emotional relationships acquire meaning precisely because they become particular and personal.

The Perfect Us: Long-Term Relationships and the Challenge of Permanence

The Perfect Us is particularly important for the present topic because it focuses on a relationship that has developed over many years. Critical discussion of the novel has highlighted its concern with the changing layers and conflicts of a long-term relationship.

This is important because choice overload is usually discussed in relation to selecting among alternatives, whereas long-term commitment involves something different: maintaining a relationship after the initial choice has already been made.

Long-term relationships change. People change careers, priorities, expectations and personalities. Consequently, commitment cannot mean remaining emotionally identical forever.

Instead, commitment requires adaptation.

The significance of The Perfect Us lies in its attention to relationship development rather than merely romantic attraction. It suggests that the continuation of love involves negotiation and adjustment.

In this sense, the novel offers a useful counterpoint to the culture of endless choice. Instead of asking whether someone else might be better, long-term commitment asks how two individuals can continue to develop their relationship as circumstances change.

A Special Literary Perspective: Durjoy Datta and Modern Romantic Consciousness

It would be inappropriate to claim that Durjoy Datta personally argues that choice overload causes relationship failure unless such a statement is directly documented. However, his fiction provides a valuable literary perspective for studying this problem.

Across his romantic narratives, several recurring concerns can be identified:

Youthful uncertainty
Attraction versus emotional maturity
Breakups and reconciliation
The desire for permanence
Conflict between personal freedom and commitment
The difference between imagined and real love
The emotional consequences of romantic decisions

His fiction is therefore useful because it captures the emotional contradictions experienced by many young characters in contemporary India.

Datta's importance in this context also comes from his accessibility to popular readers. His novels are written around contemporary experiences and young protagonists rather than abstract philosophical theories. Penguin describes Of Course I Love You... as a story that candidly explores issues faced by young adults in everyday life.

Consequently, his fiction can be read alongside psychological theories of choice and commitment to understand how contemporary romantic consciousness is represented in popular literature.

Choice Overload versus Genuine Freedom

An important distinction must be made between freedom of choice and choice overload.

Freedom is valuable. Young people should have the ability to decide whom they wish to know, whether they wish to enter a relationship and what kind of relationship is appropriate for them.

Choice overload begins when freedom becomes endless comparison.

The difference can be expressed as follows:

Freedom of choice:
"I can choose the relationship that fits my values."

Choice overload:
"I must keep searching because there may always be someone better."

The first encourages autonomy. The second can encourage anxiety.

Therefore, the solution is not to reduce young people's freedom. Instead, individuals need stronger decision-making skills and clearer personal values.

The Role of Emotional Maturity

Long-term commitment depends greatly upon emotional maturity.

Emotional maturity involves understanding one's feelings, communicating clearly, respecting boundaries, accepting differences and recognizing that relationships require mutual effort.

Choice overload can make commitment difficult when individuals interpret normal relationship challenges as evidence that they selected the wrong person.

A mature approach asks:

Are our fundamental values compatible?

Can we communicate respectfully?

Do we feel safe and respected?

Can we solve disagreements constructively?

Are both individuals willing to contribute to the relationship?

These questions are more meaningful than simply asking whether another person might be more attractive or exciting.

Commitment in the Contemporary Age

Commitment should not be understood as the opposite of freedom.

A healthy commitment is a conscious choice to invest in a relationship while respecting the individuality of both people.

The modern world offers more possibilities than previous generations. This is an important social achievement. But abundance must not become an excuse for permanent indecision.

The central challenge is therefore psychological rather than technological.

Young people need to learn that every meaningful decision involves alternatives that are not chosen. Choosing one path necessarily means not taking another. The existence of unchosen alternatives does not automatically make the chosen relationship inferior.

This principle is central to Schwartz's discussion of choice: excessive alternatives can make people less satisfied because they continually imagine what they might have chosen instead.

Conclusion

The illusion of abundance is one of the important psychological challenges of contemporary romantic culture. Modern youth have unprecedented opportunities to communicate, meet people and form relationships. Yet the same abundance can create uncertainty, comparison and unrealistic expectations.Choice overload does not mean that having many choices is inherently harmful. Rather, the problem emerges when individuals become psychologically trapped by the possibility of a better alternative.

Theories developed by Sheena Iyengar, Mark Lepper and Barry Schwartz provide a useful framework for understanding this phenomenon. Their work demonstrates that more alternatives do not automatically lead to greater satisfaction.When applied to romantic relationships, the theory suggests that continuous comparison may weaken emotional investment. A relationship may be abandoned not because it is fundamentally unsuitable but because the individual believes that a better possibility must exist elsewhere.Durjoy Datta's fiction provides an important literary perspective on this issue. His novels portray young people experiencing attraction, uncertainty, emotional conflict, separation, reconciliation and the desire for lasting relationships. From Of Course I Love You... to The Perfect Us, his fiction repeatedly explores the tension between romantic desire and emotional responsibility. His characters demonstrate that love cannot be reduced to the act of choosing a person; it also involves the difficult process of understanding and sustaining a relationship.The "special opinion" that emerges from a literary reading of Datta is therefore not a claim about his private beliefs but an interpretation of the recurring ideas in his fiction. His work suggests that contemporary love exists between fantasy and reality, freedom and commitment, desire and responsibility.Ultimately, the solution to choice overload is not to eliminate choice. It is to develop the ability to choose consciously. A meaningful relationship cannot be judged solely by the number of alternatives available outside it. Its value emerges through communication, trust, respect, emotional growth and shared experience.The modern world may provide an abundance of possibilities, but abundance alone cannot create emotional fulfillment. Sometimes, lasting commitment begins when a person stops asking, "What else could I choose?" and starts asking, "How can I responsibly value the choice I have made"

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20. This version is suitable as a college-level English research paper. The Durjoy Datta section is deliberately presented as literary analysis rather than as an unsupported claim about his personal views. His bibliography and publication details have been checked against Penguin Random House India sources.

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Original Article

Yogic Harmony and W B Yeats's Philosophy

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Abstract:

Yeats was metaphysical poet of distinctive order and visionary poet. His poetry and philosophy matured much before he returned back to vedant philosophy of universal harmony and philosophy. Yeats was intrinsically embedded in harmony of nature right from the beginning of his poetic career. The Celtic past he returned are archetypes of limited significance to him and vaster and magnitude of visionary philosophy awakened in later poetry. The universal soul, manifestation of a divine nature and harmonious links are the philosophical driving. The Yeats awakened knowledge vouchsafes his philosophy, reflected in the magnitude of arts and artefacts, sages and fairies. The artefacts, gold and golden bird are evocative of his soulful meaning. The harmonious spirit soul and art embedded in the soul are eternal significance that are intricately embedded in Yeats's philosophy. The spiritual incarnation of all souls; material and immaterial are imminent to his study and philosophically driven by Yeats.

Key Words: *Primitivism, Mysticism, Paganism, Occult and Celtic*

Myth of Aengus: Paradigm for Yeats' Self

Yeats was infatuated by the myths of Aengus. The myth provided him personal patterns. Aengus, the god of love and beauty had a golden harp. His kisses turn into birds and hovers round his head. His songs inspire love among boys and girls.

Yeats personified this mythical reference and impersonated himself into Aengus. Aengus caught a magical fish. The fish turns into glimmering girl. He went to light a fire when the glimmering girl vanished. She became evanescent when he tried to catch her. Yeats's efforts of love and passion are modelled on the myth. Like Aengus he tried to love Maud but she vanished from marriage bonds with Yeats and subsequently married John MacBride. The glimmering girl 'called me by my name and ran / And faded through the brightening air.' Yeats had loneliness as well as concreteness of his belief, as Maud Gonne possessed. Maud Gonne was centre of his love 'glimmering girl' and his unrequited love allowed him to bask in poetic creation. Yeats had the compulsions other than self like national literature, generating poetic tradition of Ireland as well as his memories and nostalgia and love for country side were working on Yeats's mind. He had incense laden shrines in the woods and wilderness, where a man sheds his personality and human spirit in conversant with outside elements. The loneliness and desolation is greater than heart's contentment;

It had become a glimmering girl
With apple blossom in her hair
Who called me by my name and ran
And faded through the brighteni
(Yeats, Songs of Wandering Aengus)

The most beautiful lyrical and mythical poem has his passionate and inner desires for his Maud Gonne. Yeats's words generated the aura of fantastic solace and beautiful feelings. Fire unequivocally is his passionate love, embracing girl is evocative.

The critics attributed Aengus myth to Yeats' pattern for sexual desires.

Myth of Aengus: Paradigm of Earthly to Spiritual Adventures

Yeats created beautiful world that is meaningful to him. These worlds are the works of mind, delighting in loveliness and austere. The spiritual element of myth is the clothing that Yeats yearned to give form to his personality, ideas and poetic development, to shape and represent his self. The spiritual element had greater assertion in his spiritual adventures in later phase of his life. The poetic treatment is spiritualizing his carnal love, finding mythical, spiritual associations, images and symbols in the mystical world, but his symbolism has not been ascetic but self-center, awakened by his love-experiences, poverty and painful sufferings. Robson called this as 'to transmute painful suffering into something that could be contemplated, this suffering was due to frustrated love…' The frustrated emotions had evolved Yeats's new kind of mythologized poetry.

Myth of Phoenix: Paradigm of Cyclic Destruction and Regeneration and Recurrence

The Phoenix is an immortal bird. Greek mythology associated the regenerating bird. The sun is associated with phoenix and takes a new birth from ashes. The phoenix symbolises sun for regeneration or even Christ's resurrection.

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It may be interpreted as the second coming of Christ. Mythical story echoed Egyptian mythology, Persian and as Garuda, the divine vehicle and eagle-bird of Vishnu in Hindu mythology. Through his creation 'A Vision', Yeats manifested the divergent-individual selves, recreational historical facts that emerged after destructions in the history. These factors seem affecting his poetic creation, imagination and themes. Yeats's personal thoughts were recurrent with women and provided paradigm. Yeats' spiritual manifestation parallels to mythic significance in his poem 'His Phoenix' to conceptualize Maud Gonne, her words and wisdom that made her noble. John Unterecker commented that Yeats defined and re-defined Maud Gonne as a symbol recurrent at every phase of his life (142). The intermittent thoughts of Maud and her past beauty that is no more self-defeating for her, like phoenix it is a rise and rebirth from the ashes. It symbolizes her mythical significance of destructive beauty, pride is self-defeating and destroying. The brutal rape of Leda by the mighty Greek God Zeus in the form of Swan bird bore Helen. Yeats laments that Maud Gonne's unparalleled beauty waned. Yeats brought her beauty in his creative imagination along with her torture, her delight in rejection of the love oscillating between love and hate and her proud look. He knew the phoenix of his youth is recurrent and aptly used as refrain to express his emotions;

And there's a score of duchess, surpassing womankind,
Or who have found a painter to make them so for pay
And smooth out stain and blemish with the elegance of his mind:
I knew a phoenix in my youth, so let them have their day.

(Yeats, His Phoenix)

Yeats had beautiful and proud beloved Maud Gonne. Beauty and pride is self-destructive. Yeats thought the pride had emerged in Maud Gonne from being beautiful. Beauty also served destructive to Maud Gonne.

Myth of Byzantium: Paradigm of Metaphysics from Earthly to Spiritual

The soul's journey is visionary. After death and before entering into hell, the soul stays in husk for the purification of the soul. Yeats sublimates the unification of soul with 'soul's clapping hands'. Byzantium is the city of union of religion, art, history and aesthetic and life that are reflected in beautiful art.

For Yeats, the journey is vertical towards eternity, but the philosophy of self predominates in his poetry. Yeats's philosophical conclusions are spiritual progress. Yeats created the soul's existence and journey in his personal myth that he followed throughout life.

Myth of Byzantium: Paradigm of Harmony and His Abstract Art and Life

The city of Byzantium with mosaic wall and artifices of art and religion become the knowledge and power. Yeats has realized artifices, monuments of art and beauty with remarkable symbol of Tower, as an architectural piece of monument, historicity, and spirituality and peaceful in the loneliness. He had Thoor Belleye, his residence in isolated nature. It was as perfect symbol of achievement and maturity. The self-knowledge of these ideas of art, life and beauty and truth became tenets that illumined his mind. The new realization of real happiness is in eternal nature. The new realization of knowledge and maturing mind detached him from the world of flesh. Yeats sought ultimate unity in his later phase with the elements of this universe- his creation in 'Unity of Being'.

Mythology: Purification of Spirits before Assuming New Form

As per mythology the dancing ritual of spirits in fire and burning in the fire is the process of purification. Yeats's Byzantium is purgatorial travail an elegiac poetic self. It emphasizes the need for suffering to get purified so as to be able to realise the pure self or soul. As per Hindu mythology, the state of rejecting the earthly pleasures and forces which Yeats cannot evade the man's life. Yeats selected either of two split asunder. The meaning of these thoughts and forces revealed warring selves. John Unterecker explained the mythical system as:All spirits, in Yeats's system, are of course purified before being reborn; but in 'Byzantium' Yeats is offering the final purification by which the elemental patterns of dancing floor 'break' the cycle of birth and rebirth, the better compulsive necessity of the spirits to live their lives over and over, begetting image after image (173).

Yeats's accumulated the knowledge of symbols, occult experiences and his philosophical book 'A Vision.' The occult not just availed him symbols and metaphors but also unity of the soul matter of the nature.

Myth of Spiritual Journey: Spiritual Paradigm of Purification

The Byzantium city of antiquity represented happiness, life and art. Byzantium evoked an abstraction from life and Byzantium art is notable for its abstract character,' 'Monuments of unageing intellect'. Yeats' search continues for permanence, like mythical Oisin in all his life wondering in the three islands for three centuries, feigning madness. Yeats had classical scriptures of India thought-provoking philosophy. Yeats believed that the harmony and realization of spiritual world could be reorganizing by journey.

Caught in that sensual music all neglect
Monuments of unageing intel
(Yeats, Sailing to Byzantium)

Yeats fed up with earthly world he left for beauty and art. The journey to the world is spiritual. Purification by journey highlights the essential philosophical truth. The realization of truth, essence of human life in the universe dissipated the life of body and earthly nature of mankind, seeking pleasure in physical satisfaction.The modern

generations had endeared the procreation and neglected the artifices, spiritual solace, happiness, where the world of spirit flourished in the silent Byzantium art. Yeats's abstract and spiritual patterns were always arbitrary and opposites. Yeats sought the synthesis between them by reconciliation of two ends. The ageing of human world is tyrannical, sickness of physical desire and sensual pleasures of the young are contrasted with permanent artifices, 'An aged man is a paltry thing, / A tattered coat upon a stick'. Beautiful art is created out of life and unification of soul that evidenced in Byzantium art. The ironical treatment underlines the ephemeral nature of human being against permanent artifices of gold enamelling. The discordant dissonance set in modern man who could not produce the integrated art in modern times. The unity, peace beauty and meandering life in the crux of grinding time from birth, emotional and corporeal desires into decrepit old age. As an escapist poet, Yeats's journey is to art symbols of beauty, eternal truth, or to the world of harmonious assemblage of art, beauty and soul. The Upanishads philosophy essentially signifying in his worship it is the realization of mythical truth, recognition of manifestation of uniqueness and significance of human existence that want in the company of the universe and then to one with him in the eternity. He wants to be a 'hammered bird by the goldsmith set on the golden bough' to sing 'eternal son about God' and eternity for the timeless.

Spiritualism: Yeats's Utopia of Nature

Yeats's treatment of nature is mystic, mythic and pagan fascination for supernatural elements. Yeats's mythic imagination blends myths for evocation of love. The essential love of the lovers, caverns and sea germinates revival. Yeats's spiritualism is belief of immortality of nature and wildness. Escapism in the fairyland or artistic world is imagined Utopia of unity. Yeats developed the concept of Daimon, after death, the soul remains in the Husk before assuming new form and waiting for most suitable form. The conglomeration of such souls is mystic and mysterious form of nature. The soul relives again their lived life. The wounds are images for revival;

Those innocents relive their death,
Their wounds open again. (Yeats, News for the Delphic Oracle)

Spiritualism is immortal and universal truth. It was wonder and solace, peace and complacency that Yeats thought as experimental poetic themes.

Proffering its sacred laurel crown,
They pitch their burdens off.
(Yeats, News for the Delphic Oracle)

The journey is relieving and ecstatic and purifying that he assumed the world to escape to Utopia. The soul's journey is mystic and purification process. Yeats's knowledge strongly proved that spiritual purification is ecstatic and pleasurable. happiness are abstract and harmonious. Yeats's urge was the union of self with eternal world and everlasting. Yeats fused Upanishad's philosophy eternal world of spirits. Yeats's acquainted the spiritual aspect behind world and manifestation. He transcended the meaning for his philosophic thoughts for the union of soul and humanity.

Myth of Byzantium: Paradigm of Spiritual and Mythical Truth

Yeats firmly believed on the immortality of soul. The soul is ultimate and permanent that closely associated with his concept of the art and beauty. Yeats had nostalgically conveyed life experiences, oscillating love relations, financial crux and

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Original Article

Consumer Impulse Buying Behaviour in the Era of Social Commerce: A Study of Social Media Influence

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Abstract

The rapid expansion of social commerce has transformed traditional online shopping by integrating social networking platforms with digital commerce. Social media platforms such as Instagram, Facebook, YouTube, Tik Tok have become influential marketplaces where consumers discover products, interact with brands, seek recommendations, and make purchases without leaving the platform. This study examines the influence of social media on consumer impulse buying behaviour in the era of social commerce. It explores the role of influencer marketing, personalized advertising, electronic word-of-mouth (e-WOM), Fear of Missing Out (FOMO), live shopping, and digital payment convenience in shaping spontaneous purchasing decisions. The study adopts a descriptive research design based on secondary data collected from books, research articles, industry reports, and government publications. The findings indicate that social media significantly encourages impulse buying by creating engaging, personalized, and emotionally appealing shopping experiences. The study concludes that while social commerce offers substantial opportunities for businesses and consumers, ethical marketing practices and consumer awareness are essential to promote responsible purchasing behaviour.

Keywords: *Social Commerce,Impulse Buying Behaviour, Social Media Marketing,Consumer Behaviour, Influencer Marketing, FOMO, Electronic Word of Mouth (e-WOM).*

Introduction:

The rapid advancement of digital technology and widespread adoption of social media have fundamentally transformed the retail landscape. Social commerce, which integrates e-commerce with social networking platforms, has emerged as a powerful business model that enables consumers to discover, evaluate, and purchase products directly through platforms such as Instagram, Facebook, YouTube, TikTok, and Pinterest. Unlike traditional online shopping, social commerce emphasizes interaction, community engagement, and personalized shopping experiences, making the purchasing process more dynamic and influential Impulse buying refers to an unplanned and spontaneous purchase made without prior intention. In the context of social commerce, consumers are constantly exposed to attractive advertisements, influencer endorsements, personalized recommendations, limited-time offers, live-stream shopping, and user-generated content. These features create emotional excitement, stimulate curiosity, and encourage immediate purchasing decisions. Psychological factors such as instant gratification, fear of missing out (FOMO), and social proof further strengthen consumers' impulse buying tendencies. Businesses increasingly utilize social mediamarketing strategies to influence consumer behavior and increase sales. Features such as one-click purchasing, interactive product demonstrations, customer reviews, and AI-driven personalized content have made the buying process more convenient and engaging. Consequently, social commerce has become an essential component of modern digital marketing strategies, particularly among younger consumers who spend significant time on social networking platforms. This study aims to examine the influence of social media on consumer impulse buying behavior in the era of social commerce. It explores the role of influencer marketing, promotional offers, electronic word-of-mouth (eWOM), visual content, and platform convenience in shaping purchase decisions. The findings of this research are expected to provide valuable insights for marketers, businesses, researchers, and policymakers in understanding evolving consumer behavior and designing effective social commerce strategies. Furthermore, the study contributes to the existing literature by highlighting the growing importance of social media in influencing impulsive purchasing decisions in the digital marketplace

Review of Literature:

The increasing adoption of social commerce has attracted considerable academic attention due to its influence on consumer purchasing behavior. Researchers have examined various social media features, including influencer marketing, electronic word-of-mouth (eWOM), user-generated content, social proof, and platform interactivity, to understand their impact on impulse buying behavior.

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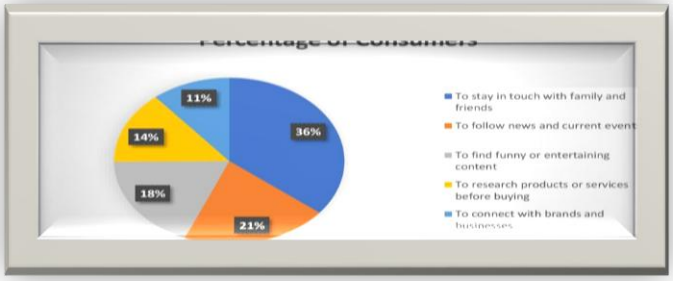
Djafarova and Rushworth (2017) found that social media influencers significantly affect consumers' purchase intentions, particularly among younger users.Their study revealed that trust, authenticity, and credibility of influencers positively influence spontaneous buying decisions on platforms such as Instagram.Chen and Wang (2021) examined the role of social commerce in shaping consumer behavior and reported that social interaction, customer engagement, and online recommendations enhance consumers' confidence and encourage impulse purchases. Their findings emphasized that social media platforms provide an interactive environment that stimulates unplanned buying.Zhang, Lu, Gupta, and Zhao (2022) investigated the impact of user-generated content and electronic word-of-mouth (eWOM) on consumer purchase behavior. The study concluded that positive customer reviews, ratings, and shared shopping experiences significantly increase consumers' trust, thereby promoting impulse buying in social commerce environments.Ming, Jianqiu, Bilal, Akram, and Fan (2021) examined the influence of Fear of Missing Out (FOMO) on online shopping behavior. Their findings indicated that limited-time offers, flash sales, and social media trends create urgency, increasing consumers' likelihood of making impulsive purchases.Li, Wang, and Lin (2023) investigated artificial intelligence-driven personalization in social commerce. Their research revealed that personalized product recommendations based on browsing history and consumer preferences significantly increase purchase intention and impulse buying behavior.

Objectives of the Study:

1. The study is undertaken with the following objectives:
2. To examine the influence of social media platforms on consumer impulse buying behaviour in the era of social commerce.
3. To identify the key factors of social commerce, such as influencer marketing, electronic word-of-mouth (eWOM), user-generated content, promotional offers, and personalized recommendations, that affect impulse buying.
4. To analyse the relationship between social media engagement and consumers' impulse purchase intentions.
5. To evaluate the impact of psychological factors, including Fear of Missing Out (FOMO), social proof, and emotional engagement, on impulse buying behavior.
6. To assess the influence of demographic variables (age, gender, education, and income) on impulse buying behaviour in social commerce.



To provide practical suggestions for marketers and e-commerce businesses to develop effective social media marketing strategies that encourage consumer engagement while promoting responsible purchasing behaviour. This objective seeks to understand how social media platforms such as Instagram, Facebook, TikTok, YouTube, Pinterest, and WhatsApp Business influence consumers' unplanned purchasing decisions. Social media has transformed from a communication tool into a shopping ecosystem where consumers can discover products, interact with brands, and make purchases instantly. Features such as interactive advertisements, live shopping, reels, stories, and integrated shopping options encourage spontaneous buying behavior. This objective evaluates the extent to which exposure to these platforms affects consumers' impulse buying tendencies. Objective focuses on identifying the major elements of social commerce that encourage consumers to make impulsive purchases. Influencer endorsements create trust and credibility, while customer reviews and ratings (eWOM) reduce uncertainty about products. User-generated content, including customer photos and videos, increases authenticity and confidence in purchasing decisions. Promotional strategies such as flashsales, discount coupons, cashback offers, and limited-time deals create urgency. Additionally, AI-based personalized recommendations present products that closely match consumer interests, increasing the likelihood of impulse purchases. Consumer engagement on social media influences purchase intentions. Activities such as liking, sharing, commenting, participating in contests, watching live-stream sessions, and interacting with brand pages strengthen consumer involvement with products and brands. Higher engagement increases product awareness, emotional attachment, and purchase intention, making consumers more likely to buy products without prior planning. The study evaluates whether active engagement positively contributes to impulse buying behaviour. The psychological mechanisms that influence impulse buying in social commerce. Fear of Missing Out (FOMO) motivates consumers to purchase products quickly to avoid losing exclusive offers or trending items. Social proof, such as positive reviews, high ratings, influencer endorsements, and large numbers of likes and shares, enhances product credibility and encourages purchasing decisions. Emotional engagement created through appealing visual content, storytelling, and interactive experiences also stimulates spontaneous buying. The combined influence of these psychological factors on consumer behaviour. Consumer impulse buying behaviour may differ across demographic groups. Factors such as age, gender, educational qualification, occupation, and income level influence purchasing decisions on social media platforms. Younger consumers are generally more active on social media and may exhibit stronger impulse buying tendencies than older consumers. Income level and educational background may also affect purchasing power, digital literacy, and

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responsiveness to social commerce strategies.

Data Analysis -Based on Secondary Data

The present study is based entirely on secondary data collected from published research articles, books, reports, government publications, industry reports, websites, and databases related to social commerce and consumer impulse buying behaviour. Since no primary survey was conducted, the analysis is descriptive and thematic in nature.

Sources of Secondary Data: The study uses data collected from:

Research articles published in Scopus, Web of Science, Google Scholar, and UGC CARE-listed journals. Reports published by Meta (Facebook & Instagram), TikTok, and YouTube.

Government publications and reports related to digital commerce.

Books and conference proceedings on consumer behavior and social commerce.

Data Analysis Approach

Trend Analysis The study examines recent trends in social commerce and the increasing use of social media platforms for online shopping. It analyzes the growth of social commerce, digital payment adoption, and consumer engagement.

Comparative Analysis A comparison is made between different social media platforms such as Instagram, Facebook, TikTok, YouTube, and Pinterest to understand their influence on consumer impulse buying behavior.

Thematic Analysis The collected literature is analyzed to identify common themes influencing impulse buying, including: Influencer Marketing, Electronic Word-of-Mouth (eWOM),User-Generated Content (UGC)Promotional Offers,Personalized Recommendations, Fear of Missing Out (FOMO),Social Proof, Emotional Engagement

Content Analysis

Published studies and industry reports are systematically reviewed to identify patterns, similarities, and differences regarding the impact of social media on impulse buying behavior. .

Findings

Social commerce has emerged as a major driver of online retail growth, with social media platforms becoming important channels for product discovery and purchasing.

Social media platforms such as Instagram, Facebook, TikTok, and YouTube significantly influence consumers' impulse buying behavior through engaging and interactive content.

Influencer marketing has become one of the most effective promotional strategies, as consumers tend to trust recommendations from influencers more than traditional advertisements.

User-generated content (UGC), customer reviews, ratings, and electronic word-of-mouth (eWOM) positively affect consumer trust and increase the likelihood of impulse purchases.

Promotional strategies such as flash sales, limited-time discounts, exclusive offers, and free shipping encourage consumers to make spontaneous purchasing decisions.

Psychological factors, including Fear of Missing Out (FOMO), emotional engagement, and social proof, play a significant role in influencing impulse buying behavior.

AI-based personalized recommendations and targeted advertisements increase product visibility and encourage consumers to make unplanned purchases.

Younger consumers, particularly Generation Z and Millennials, are more likely to engage in impulse buying due to their higher use of social media and digital shopping platforms.

The integration of secure digital payment systems and one-click checkout has reduced purchasing barriers, making impulse buying more convenient.

The literature consistently indicates that social media has transformed consumer purchasing behavior by creating an engaging, personalized, and interactive shopping environment.

Suggestions

Based on the findings of the study, the following suggestions are recommended: Businesses should create authentic and engaging social media content to build consumer trust and encourage long-term customer relationships. Marketers should collaborate with credible influencers whose values and audience align with their brands to improve campaign effectiveness. Companies should encourage customers to share genuine reviews and user-generated content, as these increase credibility and positively influence purchase decisions. Promotional campaigns such as flash sales and limited-time offers should be used strategically without misleading consumers or encouraging excessive spending.Social commerce platforms should provide transparent product information, clear pricing, and easy return policies to enhance consumer confidence. AI-driven personalization should be implemented responsibly while protecting consumer privacy and complying with data protection regulations. Consumer awareness programs should educate online shoppers about impulse buying and encourage informed purchasing decisions.

Policymakers should strengthen consumer protection regulations related to online advertising, influencer disclosures, and digital marketing practices. Future research should examine emerging technologies such as artificial intelligence, augmented reality (AR), virtual reality (VR), and live-commerce in shaping consumer buying behavior. Businesses should continuously monitor changing consumer preferences and technological developments to design innovative, ethical, and customer-centric social commerce strategies.

Conclusion

The rapid expansion of social commerce has significantly transformed consumer purchasing behavior by integrating social media platforms with online shopping experiences. Based on the analysis of secondary data from published research articles, industry reports, and scholarly literature, this study concludes that social media has become a powerful marketing and sales channel that strongly influences consumer impulse buying behavior. Interactive platform features, influencer marketing, electronic word-of-mouth (eWOM), user-generated content, personalized recommendations, promotional campaigns, and seamless shopping experiences encourage consumers to make spontaneous purchasing decisions. The study further reveals that psychological factors such as Fear of Missing Out (FOMO), social proof, emotional engagement, and trust play a crucial role in shaping impulse buying behavior. Younger consumers, particularly those who actively engage with social media platforms, are more likely to make impulsive purchases due to continuous exposure to digital content and targeted marketing strategies. At the same time, advancements in artificial intelligence, mobile commerce,

and secure digital payment systems have made online shopping more convenient and accessible, further strengthening the growth of social commerce.The findings highlight that businesses can enhance customer engagement and improve sales performance by adopting ethical and customer-centric social commerce strategies. However, organizations should ensure transparency in advertising, protect consumer privacy, and promote responsible marketing practices to build long-term consumer trust.

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Original Article

Green Synthesis of Schiff Base Compounds Using Lemon Juice as a Natural Catalyst: A Sustainable Approach

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Abstract
Green chemistry emphasizes environmentally friendly synthetic methods that minimize hazardous chemicals and waste. In this study, Schiff base compounds were synthesized using lemon juice as a natural acidic catalyst. Equimolar amounts of aromatic aldehyde and primary amine were mixed in ethanol, followed by the addition of fresh lemon juice. The reaction proceeded efficiently under mild conditions, producing the desired Schiff base with good yield and purity. The synthesized compound was characterized by its melting point and spectroscopic techniques. This eco-friendly method reduces the use of toxic catalysts, lowers energy consumption, and supports sustainable organic synthesis.

Keywords: *Green Chemistry, Schiff Base, Lemon Juice, Natural Catalyst, Sustainable Synthesis.*

Introduction:

Green chemistry is an important branch of modern chemistry that focuses on designing environmentally friendly chemical processes by minimizing the use of hazardous substances and reducing waste generation. Traditional methods for synthesizing organic compounds often require toxic catalysts, harmful solvents, and high energy consumption, which can adversely affect both human health and the environment. Therefore, the development of sustainable and eco-friendly synthetic methods has become a major area of research. Schiff bases are a significant class of organic compounds containing an azomethine (-C=N-) functional group, generally formed by the condensation reaction between primary amines and aldehydes or ketones. These compounds exhibit a wide range of biological and industrial applications, including antimicrobial, antifungal, antiviral, anticancer, anti-inflammatory, and antioxidant activities. They are also extensively used as intermediates in pharmaceutical synthesis, analytical chemistry, coordination chemistry, dyes, pigments, and polymer industries. In recent years, natural catalysts have gained considerable attention as environmentally benign alternatives to conventional mineral acids. Lemon juice, which is rich in citric acid and other organic acids, serves as an effective, inexpensive, biodegradable, and readily available natural catalyst. It facilitates the formation of Schiff bases under mild reaction conditions without requiring hazardous chemicals. The present study demonstrates the green synthesis of Schiff base compounds using lemon juice as a natural catalyst. This approach offers a simple, cost-effective, and sustainable method that aligns with the principles of green chemistry by reducing environmental impact while maintaining good product yield and purity.

Objectives :

1. To synthesize Schiff base compounds using lemon juice.
2. To replace hazardous catalysts with a natural catalyst.
3. To obtain high yield under eco-friendly conditions.
4. To demonstrate a sustainable organic synthesis method.

Materials Required :

1. Aromatic aldehyde (Benzaldehyde)Primary amine (Aniline)
2. Ethanol
3. Fresh lemon juice
4. Beaker, conical flask, magnetic stirrer
5. Filter paper and funnel

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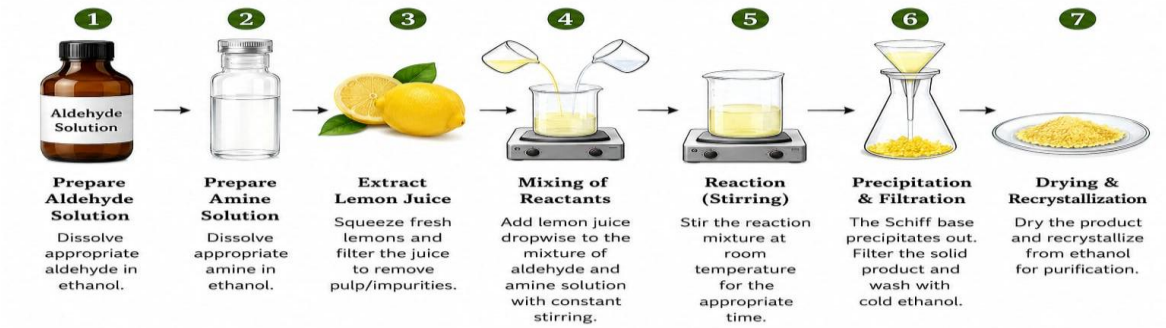
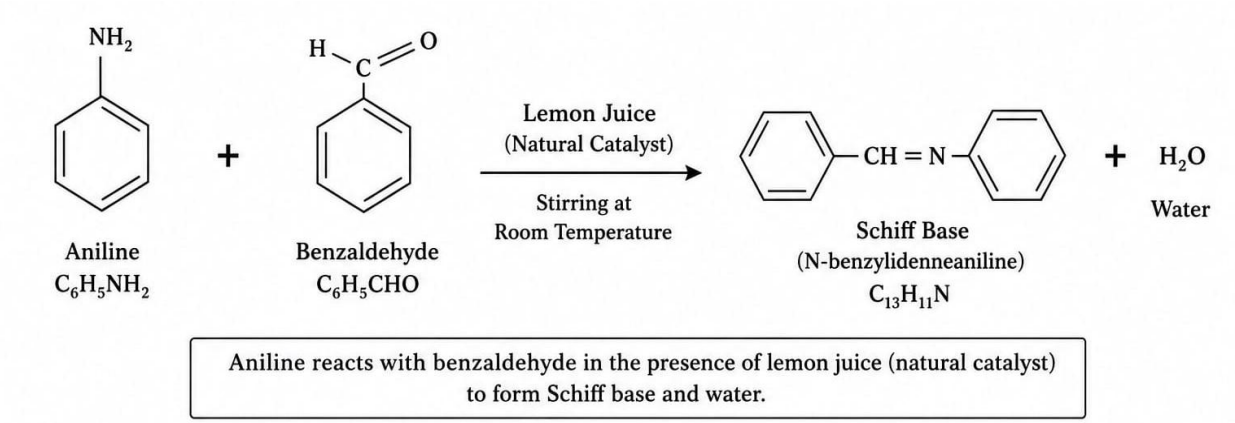
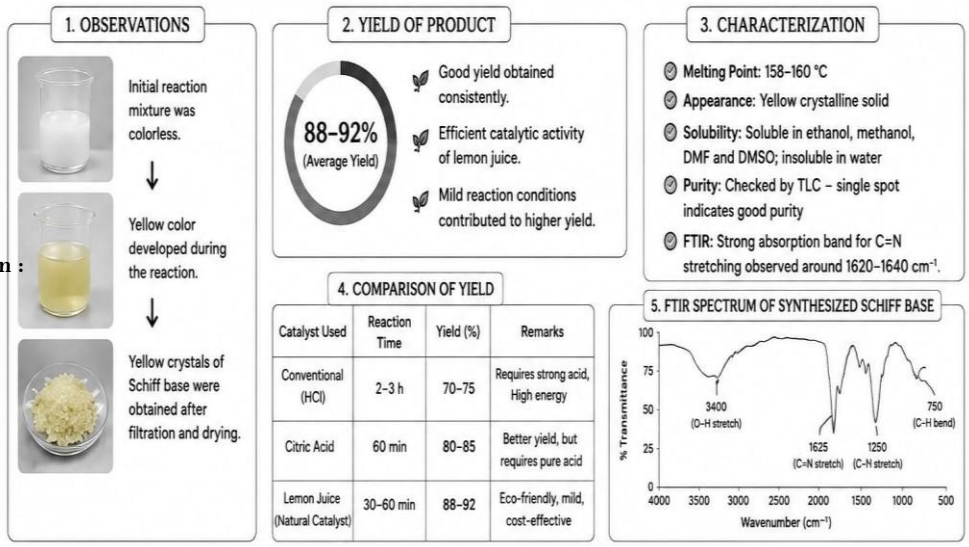
Methodology :





Result and Discussion :



Conclusion :

The present study successfully demonstrated the green synthesis of Schiff base using lemon juice as a natural catalyst under mild reaction conditions. The method produced a high yield (88–92%) with good purity while reducing the use of hazardous chemicals. The synthesized product was confirmed by melting point, TLC, solubility studies, and FTIR analysis. The use of lemon juice makes the process simple, economical, eco-friendly, and energy-efficient. This method supports the principles of Green Chemistry and provides a sustainable alternative to conventional acid-catalyzed synthesis. It is suitable for laboratory, educational, and future research applications.

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Conflicts of interest

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Original Article

"Geographical Analysis Of Disease Distribution And Accessibility To Health Care Services In Solapur District."

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Abstract

The spatial distribution of diseases and the accessibility of health care services are important indicators of public health and regional development. This study examines the geographical patterns of disease distribution and the accessibility of health care services in Solapur District, Maharashtra, from a medical geography perspective. Solapur district experiences diverse health challenges due to variations in climate, rainfall, population density, socio-economic conditions, and the uneven distribution of health infrastructure. The study focuses on the spatial and temporal distribution of major communicable and non-communicable diseases across the district's talukas and evaluates the accessibility of health care facilities, including Primary Health Centres (PHCs), Rural Hospitals, Sub-Centres, Community Health Centres (CHCs), and tertiary care hospitals. The research is based on secondary data collected from government sources such as the Census of India, District Health Office, National Health Mission (NHM), Health Management Information System (HMIS), and other published reports. Geographic Information System (GIS) techniques are employed to prepare thematic maps illustrating disease prevalence and health care accessibility. Statistical methods, including correlation analysis and spatial comparison, are used to identify relationships between disease occurrence and geographical, demographic, and socio-economic factors. The findings indicate significant spatial disparities in both disease burden and health care accessibility across the district. Rural and drought-prone talukas experience comparatively limited access to quality health services, contributing to higher vulnerability to infectious diseases. Urban centres such as Solapur City have better health infrastructure but continue to face challenges associated with population concentration and lifestyle-related diseases. The study highlights the need for equitable distribution of health care facilities, improved transportation connectivity, strengthened preventive health programmes, and GIS-based health planning to reduce regional inequalities. The results provide valuable insights for policymakers, health administrators, and planners to enhance public health services and achieve sustainable and inclusive health development in Solapur District.

Keywords: *Medical Geography, Disease Distribution, Health Care Accessibility, GIS, Spatial Analysis, Solapur District, Public Health, Health Infrastructure.*

Introduction

1. Health is a fundamental component of human development and plays a crucial role in improving the quality of life and socio-economic progress of a region. The geographical distribution of diseases and the accessibility of health care services are closely influenced by environmental, demographic, socio-economic, and infrastructural factors. Medical Geography, a specialized branch of human geography, examines the spatial and temporal patterns of diseases and the relationship between health, environment, and health care infrastructure. Understanding these relationships helps identify disease-prone areas, disparities in health service availability, and the factors affecting public health outcomes. Solapur District, located in the south-eastern part of Maharashtra, exhibits considerable geographical diversity, including semi-arid climatic conditions, recurrent droughts, uneven rainfall, rapid urbanization, and variations in population density. Ethanol

These characteristics influence the occurrence and spread of communicable diseases such as diarrhoea, malaria, dengue, tuberculosis, and water-borne infections, as well as the growing burden of non-communicable diseases such as diabetes, hypertension, cardiovascular diseases, and cancer. The incidence of diseases varies across the district due to differences in environmental conditions, sanitation, literacy, income, occupational structure, and access to safe drinking water. Accessibility to health care services is another critical determinant of public health.

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The availability and spatial distribution of Primary Health Centres (PHCs), Sub-Centres, Rural Hospitals, Community Health Centres (CHCs), and tertiary hospitals significantly influence disease prevention, early diagnosis, treatment, and health outcomes. Although Solapur district has an extensive public health network, disparities remain between urban and rural areas in terms of distance to health facilities, transportation connectivity, availability of medical personnel, and quality of health services. Such inequalities often result in delayed treatment and increased disease burden in remote and underserved areas. This study aims to analyse the geographical distribution of major diseases and evaluate the accessibility of health care services across the talukas of Solapur District. Spatial analysis using Geographic Information System (GIS), along with demographic, environmental, and health-related data, is employed to identify regional disparities and disease hotspots. The study also examines the relationship between disease occurrence and geographical factors such as climate, rainfall, land use, settlement pattern, population density, and health infrastructure. The findings of this research are expected to contribute to the field of Medical Geography by providing a comprehensive understanding of disease distribution and health care accessibility in Solapur District. The study will assist policymakers, health planners, and local authorities in identifying priority areas for strengthening health infrastructure, improving resource allocation, enhancing accessibility to medical services, and developing evidence-based public health strategies. Ultimately, the research seeks to support equitable and sustainable health care development, reduce regional health disparities, and improve the overall health status of the population in Solapur District.

Study Area

The present study is confined to Solapur District, located in the south-eastern part of the state of Maharashtra, India. The district occupies a strategic geographical position between 17°05′ and 18°32′ North latitude and 74°42′ and 76°15′ East longitude. It forms part of the Pune Division and shares its boundaries with Pune and Satara districts to the west, Ahmednagar district to the north, Osmanabad and Dharashiv districts to the east, and the state of Karnataka to the south. The district covers an area of approximately 14,895 square kilometres, making it one of the largest districts in Maharashtra. Administratively, Solapur District consists of 11 talukas: Solapur North, Solapur South, Akkalkot, Barshi, Madha, Karmala, Pandharpur, Malshiras, Sangola, Mangalwedha, and Mohol. Solapur City serves as the district headquarters and is the major commercial, industrial, educational, and medical centre of the region. The district experiences a semi-arid tropical climate, characterised by hot summers, moderate winters, and low to moderate rainfall. The average annual rainfall ranges between 450 and 700 mm, with considerable spatial variation across the district. Frequent droughts, high temperatures, and water scarcity influence agricultural productivity as well as the occurrence of several water-borne, vector-borne, and climate-sensitive diseases. The Bhima, Sina, Nira, Man, and Bori rivers are the major river systems that support irrigation and domestic water supply. According to the 2011 Census of India, Solapur District had a population of approximately 4.32 million, with a literacy rate of about 77%. The district has a mixed settlement pattern consisting of densely populated urban centres and widely dispersed rural villages. Agriculture remains the primary occupation, while industries such as textiles, sugar processing, and small-scale manufacturing contribute significantly to the district economy. From a public health perspective, Solapur District possesses a multi-tier health care system comprising Primary Health Centres (PHCs), Sub-Centres, Community Health Centres (CHCs), Rural Hospitals, Sub-District Hospitals, District Hospitals, and tertiary care institutions. Despite improvements in health infrastructure under various government programmes, disparities in the spatial distribution and accessibility of health care services persist between urban and rural areas. Remote villages often face challenges related to travel distance, transportation, availability of medical personnel, and specialised treatment facilities. The district also experiences a dual burden of disease. Communicable diseases such as diarrhoea, dengue, malaria, tuberculosis, and viral hepatitis continue to affect public health, particularly during the monsoon season. At the same time, non- communicable diseases including diabetes, hypertension, cardiovascular diseases, cancer, and chronic respiratory illnesses are increasing due to urbanisation, changing lifestyles, and population ageing. Solapur District has been selected as the study area because it presents considerable geographical diversity in climate, population distribution, socio-economic conditions, and health infrastructure. These variations provide an appropriate setting for examining the spatial distribution of diseases and the accessibility of health care services. The study adopts a medical geography approach to identify disease hotspots, assess taluka-wise inequalities in health care accessibility, and support evidence-based planning for equitable and sustainable health service delivery in the district.

Objectives:

To assess the accessibility and availability of healthcare services and health facilities across the talukas of Solapur district.

Data Collection & Methodology:

Primary & Secondary Data:

Primary data is collected through questionnaire, discussion with hospitals committee members and interview with Doctor. Medical officer, patient's supervisors & officers working at Civil Hospital, Sib district hospitals and Rural Hospitals & Panchayat Samiti in Solapur district through interview schedules. As the study requires more detailed information and opinions regarding the Z.P. office Health Department. Secondary data is collected through census reports, Health Report of India & Maharashtra various years, analysis of and socio economic survey report of various years published by Zilha Parishad of Solapur health report and other published study material etc. Various books, various articles magazines, various government reports,

Methods of Data Analysis:

The collected data will be analysed and interpreted with the help of qualitative and quantities techniques like ratio, percentage and average. For the purpose of collecting primary data a detailed and comprehensive questionnaire will be prepared on the basis of objective of the study. As well as personal discussion and interviews will be held with the help of the peoples living in a study region and official record will get with the help of doctors of the concerns.

In Solapur district through 97 PHCs the available health care facilities are not adequate and they have lack of most the facilities. There are some short comings noticed in Primary Health Centres of Solapur district. The following services are observed in PHCs of Solapur district. Table no. 1 shows the availability of health facilities in Primary

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Health Centresable no. 1 Available Health in primary health centres of Solapur district: facilities in Primary Health Centres of Solapur
districtAvailable health care facilities

Sr.no	Health facilities	Percrntage (%)
1	Outpatient (OPD) services	40
2	Routine immunization	100
3	Family planning and reproductive health services	90
4	Treatment of common communicable diseases And non-communicable diseases	80
5	Basic laboratory services (blood sugar, haemoglobin, malaria test	60
6	ICU Centers	30
7	HIV TEST	60
8	Adolescent health services	50
9	Ambulance services (102/108)	40
10	Dog bits emergency injection	100
11	Snake bits emergency injection	75
12	Operation Theartre	75

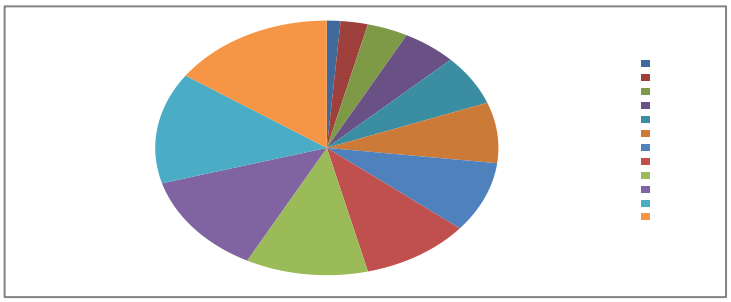

Fig.1 Available Health facilities in Primary Health Centres of Solapur district
Data Interpretation:

Table No. 1: Available Health Facilities in Primary Health Centres of Solapur District Table No. 1 presents the availability of major health facilities in the Primary Health Centres (PHCs) of Solapur district. The findings indicate considerable variation in the availability of different healthcare services across the surveyed PHCs.Routine immunization and dog-bite emergency injection services are available in 100% of the PHCs, indicating that preventive healthcare and emergency post-exposure treatment are given the highest priority in the district. Family planning and reproductive health services are available in 90% of PHCs, reflecting the strong implementation of maternal and reproductive healthcare programmes. Treatment facilities for common communicable and non-communicable diseases are available in 80% of PHCs, showing that most centres provide essential medical care for major illnesses. Snake-bite emergency injection and operation theatre facilities are available in 75% of PHCs, suggesting relatively good emergency preparedness, although these services are still not universally available.

Basic laboratory services, including blood sugar, haemoglobin, malaria testing, and HIV testing, are available in 60% of PHCs. This indicates that a significant proportion of centres lack adequate diagnostic facilities, which may delay disease diagnosis and treatment. Adolescent health services are available in only 50% of PHCs, highlighting the need to strengthen health programmes targeting adolescents. The availability of outpatient (OPD) services and ambulance services (102/108) is reported as 40%, indicating limited accessibility to routine medical consultation and emergency transport in many PHCs. The lowest availability is observed for ICU facilities (30%), which is expected because intensive care services are generally provided at higher-level healthcare institutions such as Rural Hospitals, Sub-District Hospitals, and District Hospitals rather than PHCs. Overall, the table suggests that preventive and primary healthcare services are relatively well established in Solapur district, whereas diagnostic facilities, emergency transportation, specialized care, and critical care services require further strengthening. Improving these facilities would enhance healthcare accessibility, reduce referral delays, and contribute to better health outcomes, particularly in rural and geographically remote areas of the district. verall, the findings suggest that while the PHCs in Solapur district provide satisfactory preventive and primary healthcare services, there are significant gaps in diagnostic, emergency, and specialized healthcare facilities. These deficiencies may affect timely diagnosis, treatment, referral, and emergency care, particularly in remote rural areas. Therefore, strengthening laboratory infrastructure, ambulance services, human resources, diagnostic facilities, and referral

systems is essential. Such improvements will enhance the accessibility, quality, and efficiency of healthcare services, reduce regional disparities, and contribute to better health outcomes in Solapur district. This conclusion supports the need for improved healthcare planning and equitable distribution of health facilities from a geographical perspective.

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Original Article

Sustainable Banking Reforms: A Pathway to Inclusive and Global Economic Development

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Abstract
The banking sector has become a force in helping the economy grow in a sustainable way. This is done by adding social and governance (ESG) ideas into the way banks work. These ideas help make sure that growth is fair for everyone and good for the planet. Sustainable banking changes try to make sure that the economy grows while also being fair and looking after the environment. They encourage things like money, online banking, responsible loans and making sure more people have access to money. These changes help reach the United Nations Sustainable Development Goals (SDGs) by making it easier for people to use services cutting down on pollution and helping the economy be stronger. In India there are efforts like the Pradhan Mantri Jan Dhan Yojana (PMJDY) online payment systems, rules for green money and rules made by the Reserve Bank of India (RBI) that have helped the banking system do more for sustainable growth. Around the world banks are using ESG rules managing dangers from climate change and making investments that're good for the future. This helps them stay strong and do better in the run.. There are still problems like not enough people knowing about these ideas worries about security different rules in different places not enough green money and not all areas having the same technology. This study looks at how banking changes that focus on being sustainable help the economy grow in an global way.

Keywords: *Banking, Green Banking, Financial Inclusion, ESG, Digital Banking, Banking Reforms, Economic Development, Sustainable Finance, SDGs, RBI.*

Introduction

The banking industry is very important for helping the economy grow. It brings together money people save helps them invest and makes sure money is used in the way possible. In the twenty-century banks have taken on more jobs than just being middlemen for money. They now have to think about the environment help people in need and make sure they are run properly. This change has caused a new kind of banking to appear. This kind of banking is called banking. It brings ideas about the environment, how people live and how companies are run into the way banks work. It affects how banks give out money what they invest in and how they manage risks. The changes in banking want to make a money system that helps the economy grow but also keeps the environment safe and makes sure everyone has a chance to be part of it. In the few years problems around the world like the weather changing the environment getting worse money not being shared well and new technology have made governments people who make rules and banks decide to be more friendly to the planet and fairer. The United Nations has goals to make the world better and the Paris Agreement talks about keeping the planet cool. These things have made banks try harder to help the world get better by giving money to projects that're good for the planet and helping people have fair money chances. In India changes to how banks work have made a difference in the last thirty years. The focus has been on making money things easier making everything digital helping more people use banks and making sure money is used in a way. Projects like the Pradhan Mantri Jan Dhan Yojana, Digital India, Unified Payments Interface, Priority Sector Lending and rules from the Reserve Bank of India about money risks and good money habits have made the banking system better at helping people and making sure the economy grows in a way. These changes have made it easier for people to use banks helped people use money and made sure banks are careful when giving out money.

Literature Review

3. Mamun, A. Y. & László, V. (2025)
Mamun and László (2025) conducted a systematic literature review on sustainable finance and financial inclusion, emphasizing the growing integration of digital finance with sustainability objectives. The study found that fintech, green finance, and financial inclusion collectively contribute to achieving the Sustainable Development Goals (SDGs). The authors highlighted that digital financial services improve access to banking while promoting environmentally responsible financial practices. They also identified digital risks and cybersecurity as emerging challenges that require stronger regulatory frameworks. 2. Singha, A. S., Ambarkhane,

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D., Venkataramani, B. & Bharti, N. (2025) Singha et al. (2025) developed a conceptual model for sustainable financial inclusion using the PRISMA methodology. Their study concluded that digital banking, financial literacy, supportive government policies, and technological innovation are essential for achieving inclusive and sustainable banking systems. The authors emphasized that collaboration among banks, regulators, and fintech companies is necessary to ensure equitable financial access while maintaining long-term sustainability.

Boafo, J. A., Maclean, E. O., Danzerl, N. O. P. & Amoafo-Danquah, K. P. (2025)

Boafo et al. (2025) reviewed the integration of Environmental, Social, and Governance (ESG) principles into global banking systems. The study found that banks adopting ESG-based lending and investment strategies experienced improved risk management, enhanced corporate reputation, and greater stakeholder confidence. The authors concluded that sustainable banking has evolved from voluntary corporate responsibility to a strategic business necessity for ensuring long-term financial resilience.

4. Xu, J. (2024) Xu (2024) examined the application of Artificial Intelligence (AI) in ESG implementation within financial institutions. The study reported that AI significantly enhances climate risk assessment, fraud detection, ESG reporting, customer engagement, and regulatory compliance. However, it also emphasized challenges related to data quality, ethical AI practices, privacy protection, and model transparency. The research suggested that responsible AI adoption can strengthen sustainable banking initiatives.

Lee, L. (2024)

Lee (2024) analysed the role of digital banks, machine learning, and large language models in promoting financial inclusion. The study concluded that digital banking technologies increase financial accessibility for underserved populations while reducing transaction costs and improving service efficiency. However, the author highlighted regulatory concerns related to cybersecurity, data privacy, algorithmic bias, and consumer protection, recommending stronger governance frameworks for sustainable digital banking.

Waliullah, M., George, M. Z. H., Hasan, M. T., Alam, M. K., Munira, M. S. K. & Siddiqui, N. A. (2025)

Waliullah et al. (2025) conducted a systematic review of cybersecurity threats affecting digital banking adoption. The study found that phishing, malware, ransomware, and data breaches remain major barriers to customer trust in digital banking. The authors emphasized that multi-factor authentication, biometric verification, blockchain technology, and AI-based fraud detection are essential for ensuring secure and sustainable digital banking ecosystems.

Need and Significance of the Study

The global banking industry is undergoing a significant transformation due to increasing concerns about climate change, environmental sustainability, financial inclusion, and technological advancements. Traditional banking systems, primarily focused on profitability, are now expected to contribute to sustainable development by integrating Environmental, Social, and Governance (ESG) principles into their operations. Sustainable banking reforms have become essential for promoting responsible lending, green financing, digital innovation, and inclusive economic growth. Consequently, there is a growing need to examine how these reforms can strengthen the banking sector while supporting national and global development objectives. In India, various initiatives such as financial inclusion programs, digital banking, green finance, and regulatory measures introduced by the Reserve Bank of India (RBI) have significantly improved access to financial services and encouraged sustainable financial practices. However, challenges such as limited awareness of green banking, cybersecurity risks, inadequate financing for sustainable projects, technological disparities, and regulatory complexities continue to hinder the effective implementation of these reforms. Understanding these issues is crucial for developing strategies that enhance the efficiency and sustainability of the banking system. The significance of this study lies in its attempt to provide a comprehensive understanding of sustainable banking reforms and their role in achieving inclusive and global economic development. The study highlights the contribution of sustainable banking to financial inclusion, environmental protection, economic resilience, and social welfare.

Research Gap

Although many studies have looked at banking ESG practices, financial inclusion and digital banking separately there is not enough research that has looked at all of them together to see how they can help make banking more sustainable for inclusive and global economic development. Most of the existing studies look at one part at a time such, as sustainability, digital financial services or rules and regulations and they pay less attention to how all of these together affect economic growth and social inclusion. Also there is not recent research that looks at Indias sustainable banking reforms and compares them with the best ways used around the world. This study wants to fill that gap by looking at banking reforms in a complete way, including the problems they face the chances they have and what policies should be put in place to help make the economy grow in a fair and lasting way. 5

Objectives of the Study

1. To examine the concept and importance of sustainable banking reforms in promoting economic development.
2. To analyse the role of sustainable banking reforms in enhancing financial inclusion and social equity.
3. To evaluate the contribution of green banking and ESG practices towards sustainable economic growth.
4. To identify the challenges and opportunities associated with the implementation of sustainable banking reforms.
5. To suggest policy measures for strengthening sustainable banking practices to achieve inclusive and global economic development.

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Research Methodology

The study looks at banking changes to make the economy more inclusive and global. It uses data from sources like the Reserve Bank of India and the World Bank to understand banking, digital banking and financial inclusion in India and worldwide focusing on parts, like inclusion and green finance.

Sustainable Banking Reforms in India

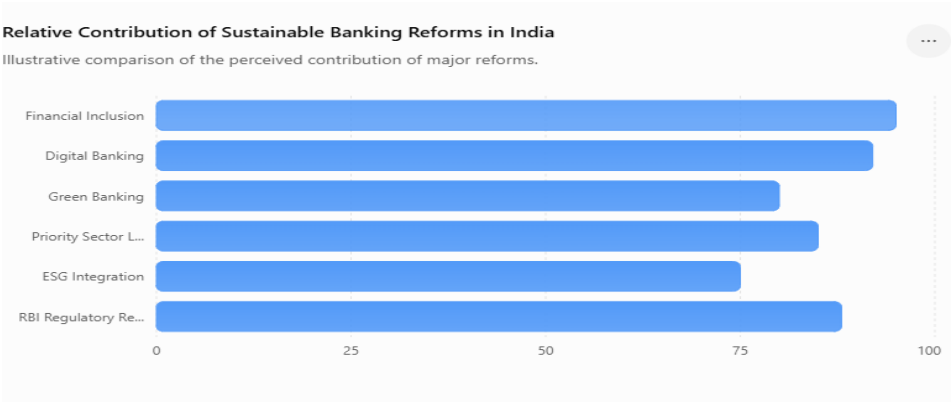
India has made changes to its banking system over the past thirty years. The goal is to make the system more inclusive and sustainable. The country wants to achieve the United Nations Sustainable Development Goals and have term economic growth.

One important change is the Pradhan Mantri Jan Dhan Yojana, which helps people who did not have bank accounts before. This program gives them access to banking services like savings accounts and debit cards. Digital banking has also changed the way people do banking in India. The Unified Payments Interface and mobile banking make it easier for people to access banking services. The Reserve Bank of India has introduced guidelines on finance and responsible lending. Banks are also using Environmental, Social and Governance principles when making lending and investment decisions.

There are still some challenges, like awareness of sustainable finance and cybersecurity threats.. With the right support and collaboration India can have a strong and sustainable banking system that helps everyone.

Table 7.1: Major Sustainable Banking Reforms in India

Sustainable Banking Reform	Key Initiative	Major Contribution
Financial Inclusion	Pradhan Mantri Jan Dhan Yojana (PMJDY)	Increased access to formal banking services
Digital Banking	UPI, BHIM, Mobile Banking, Internet Banking	Promoted cashless transactions and financial accessibility
Green Banking	Paperless Banking, E-Statements, Green Loans	Reduced environmental impact and promoted sustainability
Priority Sector Lending	Agriculture, MSMEs, Renewable Energy	Enhanced inclusive economic development
ESG Integration	Responsible Lending and Sustainable Investments	Improved environmental and social governance
RBI Regulatory Reforms	Climate Risk Management and Cybersecurity Guidelines	Strengthened financial stability and sustainable banking



Global Sustainable Banking Practices

Banks around the world are trying to be more sustainable. They want to help with problems like the environment and money issues. The United Nations has goals like the Sustainable Development Goals to guide banks.

A) Banks are investing in energy and clean transportation.

B) They give loans to people who want to help the environment.

C) They use technology like blockchain to make their operations better.

Some countries are making rules to help banks be more sustainable. They want banks to tell them about the risks they face from climate change. The World Bank and other organizations are working together to help countries make their banking systems more sustainable. Banks are learning that being sustainable is good for the earth and good for business. They are helping the environment making the economy stronger and helping people who do not have a lot of money. Banks need to work use new technology and be transparent to overcome challenges. Sustainable banking is a thing for the earth and, for business.

Table 8.1: Global Sustainable Banking Practices

Global Practice	Major Focus Area	Expected Outcome
Green Finance	Renewable Energy and Clean Infrastructure	Reduced carbon emissions

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ESG-Based Banking	Responsible Lending and Investments	Sustainable business growth
Digital Banking	AI, Blockchain and FinTech	Improved financial inclusion and operational efficiency
Climate Risk Management	Climate Risk Assessment	Enhanced financial resilience
Sustainable Investment	Green Bonds and ESG Funds	Long-term sustainable returns
International Collaboration	SDGs, UNEP FI, World Bank, IMF	Global sustainable economic development

ESG and Green Banking Initiatives

Environmental, Social and Governance (ESG) principles are now a part of modern banking. They help banks balance profit with care, social duty and good leadership. ESG allows banks to assess risks and make choices about loans and investments. This helps build a sustainable economy. More people are aware of climate issues and companies are being held accountable. This has pushed banks around the world to use ESG in their plans and daily work. The environmental part of ESG focuses on reducing the impact of banking on nature. Banks are using tools to cut paper use and lower carbon emissions. They also offer loans for energy, wind power and green buildings. The social part focuses on helping everyone have access to banking improving lives and supporting business. Banks help communities teach financial skills and support women and small businesses.

The governance part makes sure banks act fairly and are open. Good leadership helps banks stay strong and trusted. In India the RBI pushes banks to manage climate risks and follow finance rules. Banks are making green loans and reporting on their efforts.. Challenges, like fake green claims and unclear rules still exist. Improving rules working together and using tech are needed. ESG helps protect the planet and build an economy.

Digital Banking and Financial Inclusion

Digital banking has changed how people bank globally. It makes services faster and easier. People can now bank anywhere anytime. It is more secure due to apps, AI and cloud computing. Digital banking is essential for ensuring everyone has access to banking. It allows people and businesses to get services like savings accounts and loans without costs. New tech helps banks reach people who lacked access before. People use phones, computers and digital wallets to bank. In India initiatives, like PMJDY, UPI, BHIM, AEPS and Digital India have helped millions access banking. They can now get money directly into accounts. Make digital payments. This reduces transaction costs. Helps the government support people. Globally digital banking makes sending money getting loans and using services easier. AI, blockchain and big data help detect fraud and improve service. FinTech companies work with banks to create products.. Digital banking also has challenges. Cybersecurity, data privacy and lack of skills are concerns. Some areas lack internet. Online fraud is rising. To fix these we need security, education and regulations. Digital banking and financial inclusion are linked. They make services accessible and help reduce poverty create jobs and strengthen the economy. Investing in infrastructure, education and tech is vital. This creates a secure and sustainable banking system that supports the economy long-term.

Challenges in Sustainable Banking Reforms

Despite progress in sustainable banking several challenges still prevent its full implementation in both developed and developing economies. A major issue is the lack of awareness about banking and ESG principles among customers, banks and businesses. Many see it as a compliance task than a business opportunity. Another challenge is the absence of ESG reporting standards. Different countries and institutions use frameworks making it hard to compare performance and measure impact. This lack of standardization also increases the risk of greenwashing. The growth of banking brings cybersecurity threats, such as data breaches and fraud which harm customer trust and require constant investment in security. Limited green financing is a problem in developing countries, where sustainable projects have high costs and long payback periods. Banks are often hesitant to invest due to uncertainty. The digital divide also limits inclusion, as rural and low-income groups struggle with internet access and digital skills. Regulatory issues, climate risks, a shortage of workers and resistance to change also affect progress. Solving these issues needs cooperation, from

governments, banks, regulators and tech companies to build a banking system.

12. Suggestions and Policy Recommendations .

To improve banking we need to do a things.

a) Strengthen rules about how banks treat the environment and society.
b) Help banks give money to projects that're good for the environment like renewable energy
c) Make sure everyone has access to banking in rural areas.
d) Keep customers information safe from hackers.
e) Teach people about banking in a way that's good for the environment.
f) Work with technology companies to make banking better.
g) Help bank employees learn about issues and new technologies.
h) Work with countries to share ideas about sustainable banking.
i) Give help to small businesses that are good, for the environment.
j) Regularly check to see if these changes are working. We need to make sustainable banking a priority. Sustainable banking is very important.

Conclusion

Sustainable banking reforms are very important for financial systems. They help the economy grow while being kind to the environment and society. Banks used to give money but now they help make the world a better place. They do this by using Environmental, Social and Governance principles, green financing and digital banking.In India things like the Pradhan Mantri Jan Dhan Yojana and digital banking have helped people get access to banking.There are still problems like cybersecurity threats and not enough green financing.Sustainable banking reforms are a way to make the economy grow and include everyone. The banking sector can help build economies and make sure people are prosperous for a long time by promoting responsible finance and taking care of the environment.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Original Article

Adsorption of Acetic Acid on Low-Cost Coconut Shell-Derived Bio-Adsorbent: Equilibrium and Isotherm Studies

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Abstract
Industrial wastewater management necessitates the development of efficient, eco-friendly, and affordable materials for the sequestration of organic pollutants. This study investigates the preparation of a bio-adsorbent derived from agricultural waste—specifically coconut shells—blended with a natural clay matrix and immobilized using an organic starch binder. The synthesized bio-adsorbent was evaluated for its efficacy in removing acetic acid from dilute aqueous solutions using classical batch adsorption experiments. Quantitative monitoring of the adsorbate uptake was systematically performed via standard neutralization titrations against normalized sodium hydroxide. The equilibrium data were systematically examined using the empirical Freundlich adsorption model. The linear model configuration exhibited a high determination coefficient (R^2 = 0.9637), confirming a heterogeneous, multilayer physical adsorption mechanism onto the porous matrix. The findings validate that coconut shell biomass acts as a sustainable precursor for organic pollutant mitigation, offering an efficient practical avenue for green industrial effluent treatment.

Keywords: *Bio-adsorbent, Coconut Shell Charcoal, Adsorption Isotherm, Freundlich Model, Acetic Acid.*

Introduction

The disposal of untreated organic chemical waste from chemical and manufacturing plants presents a critical environmental challenge. Acetic acid represents a common byproduct in many chemical processing operations, and its accumulation in aqueous discharges severely deteriorates water quality metrics. Conventional effluent treatments, though effective, are often restricted by prohibitive costs, complex operations, or significant energy footprints. Consequently, modern research has heavily pivoted toward the design and optimization of sustainable bioretention media and cheap carbon materials derived from agricultural waste, including fruit peels, plant leaves, nut husks, and coconut shells. Adsorption processes are widely regarded as superior due to their operational simplicity, cost-efficiency, and minimal residual sludge generation. The operational framework of adsorption relies on surface-directed phenomena driven by localized net unbalanced attractive forces on the solid boundary, minimizing residual thermodynamic surface energy. Depending on the fundamental nature of the interactions governing the phase boundary, adsorption is categorized into chemisorption (involving genuine chemical orbital overlapping and direct electron transfer) and physisorption (governed by weak, long-range intermolecular Van der Waals interactions). Coconut shell biomass possesses favorable structural properties for adsorbent synthesis, including a robust lignocellulosic network, low baseline ash content, high mechanical resilience, and the capability to develop dense microporous architectures under moderate thermal processing. To decipher the surface interaction characteristics, structural heterogeneity, and localized capacities, standard mathematical models known as adsorption isotherms are applied. The empirical Freundlich isotherm assumes a non-uniform surface distribution with varied binding energy sites, which effectively describes multi-layered physisorption across uneven surface profiles. This study describes the design, structural composition, and equilibrium evaluation of a composite bio-adsorbent explicitly optimized for removing aqueous carboxylic acids.

Experimental Methodology

1 Materials and Reagents

Raw coconut shell waste was gathered locally. Natural fine clay and pure laboratory-grade starch were sourced as structural binders.

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Glacial acetic acid, crystalline anhydrous oxalic acid, analytical grade sodium hydroxide pellets, and phenolphthalein indicator solutions were acquired from the departmental stock. Distilled water was universally utilized throughout all dilution, preparation, and cleaning protocols.

2 Preparation of the Composite Bio-Adsorbent

3. and passed through standard sieves to produce an extremely fine uniform powder.
4. Fine particulate clay was filtered and blended thoroughly with the ground charcoal powder.
5. A viscous starch binding solution was formulated using hot water and integrated into the clay-charcoal blend to achieve a homogeneous paste.
6. The resulting matrix was cast, transferred into clean ceramic storage pots, and allowed to air-dry entirely at room temperature to establish structural stability.

3 Standardization of Aqueous Sodium Hydroxide

Because sodium hydroxide is hygroscopic, a primary standard solution of 0.1 N oxalic acid was accurately synthesized. A nominal 0.2 N analytical NaOH titrant solution was subsequently titrated against a fixed 10 mL aliquot of the 0.1N oxalic acid standard, using standard phenolphthalein as the endpoint indicator. The precise working normality (N') was calculated via the classical equivalence relationship:

$$N' = \{N_{oxalic} * V_{oxalic}\} / V_{NaOH}$$

Batch Equilibrium Adsorption Tests

The fabrication workflow of the composite bio-adsorbent was systematically managed as follows:

1. Cleaned, thoroughly dehydrated coconut shells were subjected to thermal pyrolysis (controlled oxygen-deficient burning) to yield raw carbonized charcoal.
2. The carbonized material was mechanically pulverized

4 Batch Equilibrium Adsorption Tests

Six independent reaction bottles were prepared by combining stock 0.1 N acetic acid and distilled water to yield a gradient of working concentrations. A fixed mass of exactly 1.0 g of the ground bio-adsorbent was accurately dosed into each reaction bottle. The reaction vessels were mechanically mounted onto a digital rotary shaking apparatus and shaken vigorously for a prolonged duration of 1 hour to ensure complete thermodynamic equilibrium. Afterward, each mixture was isolated using analytical filter paper. A precise 10 mL aliquot of each clear filtrate was collected and carefully titrated against the standardized NaOH solution to determine the residual unadsorbed concentration of acetic acid within the aqueous phase.

Results and Discussion

Bottle No.	Vol. Acid (mL)		Vol. Water (mL)	Adsorbent Mass m (g)	Initial Conc. Co (mol/L)	Filtrate Vol. V1 (mL)	Titrant Vol. V2 (mL)	Equil. Conc. Ce (mol/L)	Adsorbed Acid X (g)	Capacity X/m (g/g)	log(X/m)	log Ce
1	50		00	1	0.10	10	3.5	0.0672	0.0984	0.0984	-1.0070	-1.172
2	40		10	1	0.08	10	2.4	0.0460	0.1020	0.1020	-0.9913	-1.337
3	30		20	1	0.06	10	1.5	0.0288	0.0936	0.0936	-1.0287	-1.540
4	20		30	1	0.04	10	0.5	0.0096	0.0912	0.0912	-1.0400	-2.017
5	10		40	1	0.02	10	0.1	0.0019	0.0543	0.0543	-1.2652	-2.721
6	05		50	1	0.01	10	0.1	0.0019	0.0543	0.0543	-1.2652	-2.721

1 Volumetric Standardization Metrics

The initial phase required computing the precise working concentration of the alkaline titrant. The standardization trials produced concurrent values documented in Table 1.

Table 1: Standardization of Titrant (NaOH) Using Primary Oxalic Acid Standard

Trial Number	Volume of 0.1N Oxalic Acid (mL)	Volume of NaOH Solution Consumed (mL)	Concurrent Value (V mL)	Calculated Normality (N', N)
1	10	5.4	5.2	0.192
2	10	5.2		
3	10	5.2		

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Using the concurrent volume of 5.2 mL, the exact operational normality of the NaOH titrant was determined to be **0.192 N**.

2 Evaluation of Filtrate Concentrations and Solute Uptake

The volumetric measurements from the batch filtrate titrations allowed for the direct evaluation of the thermodynamic parameters. The initial acetic acid concentration (Co) before introducing the adsorbent mass was derived from the stock dilution ratio:

Co = {Cstock * Vacetic}/50

The operational equilibrium concentration (Ce) of acetic acid remaining within the solution was calculated from the filtrate neutralization volumes using the relation:

1. Table 2: Comprehensive Batch Equilibrium Adsorption Data and Derived Thermodynamic Variables

3 Adsorption Isotherm Modeling Analysis

To identify the mathematical model regulating the partition coefficient of the solute, the data was fitted to the linearized version of the Freundlich adsorption isotherm:

$$\log\left(\frac{X}{m}\right) = \log K + \frac{1}{n}\log C_e$$

wher

$Ce = \{N' * V_2\}/V_1$

where V_1 signifies the tested filtrate volume (10 mL) and V_2 represents the observed volume of NaOH titrant spent. The absolute mass of acetic acid adsorbed (X, in grams) was calculated using the equation:

$X = \{(Co - Ce) * V_{total} * Mw\}/1000 = \{(Co - Ce) * 50 * 60\}/1000$

where V_{total} = 50 mL and Mw = 60 g/mol (the molecular weight of acetic acid). Given that a constant adsorbent mass (m = 1.0g) was deployed, the normalized capacity variable (X/m) maps directly to X. Table 2 presents the compiled primary experimental observations and calculated parameters.

e K acts as the empirical capacity metric and 1/n denotes the slope factor signaling the adsorption intensity. Plotting log(X/m) against log Ce yields a linear trend line where the intercept correlates to log K and the slope corresponds to 1/n. The experimentally derived linear regression model equation achieved from the data was:

y = 0.9452x + 1.3982

The coefficient of determination was computed as **R^2 = 0.9637**. This high value signifies a robust correlation, verifying that the empirical model successfully accounts for approximately 96.37% of the total baseline data variation.

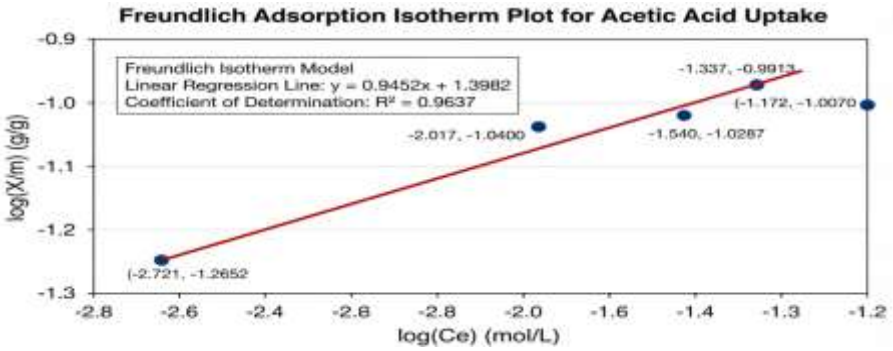

Figure 1: Freundlich Adsorption Isotherm Plot for Acetic Acid Uptake showing the linear regression line y = 0.9452x + 1.3982 and R^2 = 0.9637]

A highly linear relationship confirms that the data fits the Freundlich isotherm model over the investigated concentration window. The slope value (1/n = 0.9452) lies within the classic 0.1 < 1/n < 1.0 optimization range, indicating a highly favorable physical adsorption mechanism onto a heterogeneous surface matrix.

4. Conclusion

This research demonstrates a successful approach for upgrading raw agricultural coconut shell waste into a high-utility composite bio-adsorbent. The mechanical integration of raw carbonized charcoal with a natural clay binder successfully produced an eco-friendly and operationally stable retention media. Batch equilibrium experiments verified that the composite material has a high affinity for removing aqueous organic contaminants, such as acetic acid, from dilute industrial effluents. The equilibrium profiles aligned with the classical Freundlich isotherm model (R^2 = 0.9637), confirming a heterogeneous physical adsorption mechanism. Given its simple synthesis, abundance of raw materials, and low operational cost, this composite adsorbent represents a highly scalable and sustainable choice for green wastewater treatment systems.

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Original Article

Impact of Climate Change on Agricultural Output and Farm Income

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Abstract :
Climate change has become one of the most significant threats to agriculture worldwide. Rising temperatures, erratic rainfall, extreme weather events, and soil degradation are adversely affecting crop production and farmers' income. Agriculture, being highly climate-sensitive, faces reduced productivity and increased production costs, particularly in developing countries like India. This study examines the impact of climate change on agricultural output and farm income, with special focus on state-wise and Maharashtra district-wise variations. The research is based on secondary sources and illustrative data to demonstrate the comparative effects of climate variability. Findings indicate that districts such as Akola, Nagpur, and Solapur are highly vulnerable, experiencing reduced crop yields and income instability. The study also explores adaptation strategies, government interventions, and policy recommendations to promote climate-resilient agriculture.

Keywords: *Climate Change, Agriculture, Farm Income, Crop Yield, Adaptation Strategies, Maharashtra, India*

Introduction :

Agriculture forms the backbone of India's economy, employing nearly half of the workforce and contributing significantly to GDP. However, climate change poses serious challenges to the sector. Rising global temperatures, shifts in rainfall patterns, increasing frequency of droughts, floods, cyclones, and heat waves threaten crop production and farm income stability. India's agricultural productivity largely depends on monsoon rainfall, soil fertility, and water availability, all of which are impacted by climate variability. Over the past few decades, extreme weather events have become more frequent and intense, affecting both irrigated and rain-fed crops. Crops such as wheat, rice, and maize are particularly sensitive to heat stress during critical growth stages. Climate change also exacerbates pest infestations, soil degradation, and water scarcity, further reducing farm yields. The consequences of these changes are severe for small and marginal farmers who have limited resources and low adaptive capacity. The economic impact of climate change extends beyond agriculture, influencing rural livelihoods, employment, and food security. Unstable farm incomes increase reliance on loans of climate change on agricultural output and farm income is crucial for designing effective policies, adaptation strategies, and sustainable farming practices.

Objectives of the Study :

credit, potentially leading to indebtedness and poverty. Therefore, understanding the impact

The study aims to:

1. Analyze the impact of climate change on agricultural output in India and Maharashtra.
2. Assess the effect of climate variability on farm income.
3. Identify state-wise and district-wise variations in climate change impact.
4. Explore adaptation strategies adopted by farmers to cope with climate risks.
5. Evaluate government interventions and policy measures supporting climate-resilient agriculture.

Methodology :

This research is based on secondary data collected from government reports, international organizations, research journals, and academic articles published between 2020–2025. The study uses **illustrative index values** to demonstrate the comparative impact of climate change on agricultural output and farm income at the state and district levels.

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Descriptive and analytical methods are applied to explain trends, risks, and mitigation strategies. The study also includes **state-wise and Maharashtra district-wise tables and chart placeholders** for visual representation.

Overview of Previous Research:
Recent studies show that climate change significantly reduces agricultural output and farm income. Rising temperatures, erratic rainfall, droughts, and floods negatively affect crop yields and soil health. Climate-Smart Agriculture (CSA) practices, such as crop diversification, drought-tolerant varieties, and efficient irrigation, improve productivity and resilience. Adoption of CSA depends on access to credit, extension services, and farmer awareness. State- and district-level studies in India, especially in Maharashtra and the Indo-Gangetic Plains, indicate that vulnerable districts experience higher yield losses and income instability. Effective government support, timely adoption of technology, and awareness programs are essential to mitigate climate risks. Overall, the literature confirms that climate change threatens food security, but adaptive practices can reduce adverse impacts.

Climate Change: A Global Phenomenon:
Climate change is a global environmental phenomenon characterized by long-term changes in the Earth's temperature, precipitation, atmospheric conditions, and weather patterns. Although the climate has naturally changed throughout Earth's history, the rapid changes observed in recent decades are largely associated with human activities. The burning of fossil fuels, deforestation, industrialization, transportation, and unsustainable land-use practices have increased the concentration of greenhouse gases such as carbon dioxide, methane, and nitrous oxide in the atmosphere. This enhanced greenhouse effect contributes to global warming and changes in climate systems worldwide. Climate change is not limited to any particular country or region; its effects are experienced across continents and ecosystems. Rising temperatures, melting glaciers, sea-level rise, changing rainfall patterns, heatwaves, droughts, floods, and extreme weather events demonstrate its widespread nature. Climate change also affects agriculture, biodiversity, water resources, human health, and economic development, making it a major global challenge requiring collective action.

Major impacts on agriculture :

1. **Increase in temperature** reduces crop growth and yields.
2. **Irregular rainfall** affects sowing and harvesting of crops.
3. **Droughts and floods** damage standing crops and soil quality.
4. **Water scarcity** reduces irrigation and agricultural productivity.
5. **Livestock productivity** declines due to heat stress and diseases.
6. **Higher production costs** increase financial pressure on farmers.
7. **Food security** is threatened due to lower agricultural output.

Impact of Climate Change on Agricultural Output :
Climate change affects agricultural output in multiple ways:

Temperature Rise
Higher temperatures accelerate crop maturity, reduce grain filling, and decrease yields of heat-sensitive crops like wheat and rice.

Rainfall Variability
Erratic rainfall causes delayed sowing, crop failure, and reduced yields, especially in rain-fed regions.

Extreme Weather Events
Droughts, floods, and cyclones destroy crops, reduce soil fertility, and increase post-harvest losses.

Soil Degradation
Climate change accelerates soil erosion, salinity, and nutrient depletion, reducing long-term productivity.

Pest and Disease Incidence
Warmer temperatures and higher humidity increase pest infestations and crop diseases, further reducing output.

District-wise Analysis: Maharashtra

District-wise Agricultural Output Graph (Maharashtra)

District	Pune	Nagpur	Ahmednagar	Nashik	Thane	Kolhapur	Satara	Solapur	Akola	Wardha
Output Impact Index	78	**82**	**80**	**75**	**70**	**77**	**79**	**81**	**83**	**80**

District-wise Agricultural Output Graph (Maharashtra)

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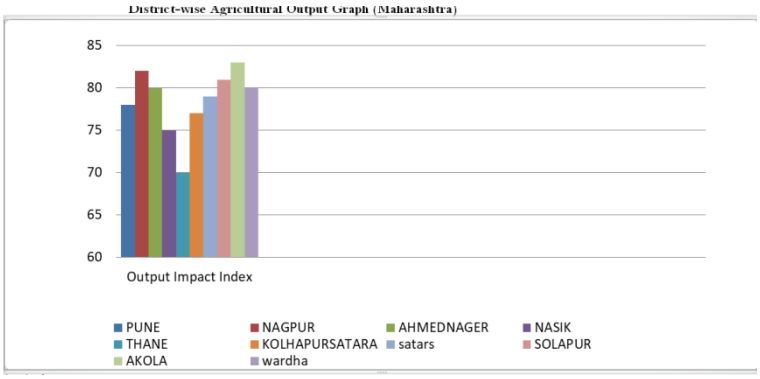

Analysis:
The graph indicates that Akola, Nagpur, and Solapur experience the highest decline in agricultural output due to climate change. Ahmednagar and Wardha show moderate output impacts because of irregular rainfall and drought conditions. Thane records the lowest impact, suggesting relatively less dependence on agriculture and better adaptive capacity

Climate change affects farm income through:

1. Reduced crop yields leading to direct income loss.
2. Increased input costs for irrigation, fertilizers, and pesticides.
3. Income instability due to frequent droughts and floods.
4. Livestock productivity decline caused by heat stress and diseases.
5. Greater dependence on loans and credit, increasing financial vulnerability
6. **Interpretation:**
   Districts like **Akola, Nagpur, and Solapur** are most affected by climate change, leading to reduced crop yields and income instability for farmers.
   Analysis:
   The graph shows that Akola, Nagpur, and Solapur have the highest agricultural income impact due to climate change. Ahmednagar and Wardha experience moderate impacts because of rain-fed agriculture. Thane shows the lowest impact, indicating lesser dependence on agriculture and better income diversification

Major Outcomes of the Study:

1. Climate change significantly reduces agricultural output and farm income.
2. Small and marginal farmers are most vulnerable due to low adaptive capacity.
3. Districts in Maharashtra such as Akola, Nagpur, and Solapur are highly impacted.
4. State-wise variations indicate that arid and semi-arid regions suffer more.
5. Adoption of adaptation strategies and government support reduces risk and stabilizes income.

Climate Change Adaptation Measures :
Farmers adopt several strategies to mitigate climate change impacts:

1. Crop diversification to spread risk.
2. Adoption of climate-resilient and short-duration crop varieties.
3. Improved irrigation methods (drip/sprinkler systems).
4. Adjusting sowing and harvesting dates according to rainfall patterns.
5. Integrated farming and agro forestry systems.
6. Soil and water conservation practices.
7. Use of weather forecasts and early warning systems.

Government and NGO support is essential to strengthen these measures through subsidies, extension services, and training programs.

Government Strategies for Climate Change :

1. Crop insurance schemes (PMFBY) protect farmers against yield losses.
2. Minimum Support Price (MSP) ensures stable income for selected crops.
3. Promotion of climate-smart agriculture under National Mission on Sustainable Agriculture (NMSA).
4. Investment in irrigation, water management, and infrastructure.
5. Agricultural extension services for knowledge transfer and awareness.
6. Early warning systems and weather forecasting services.

Strategies for Climate Change Mitigation:

1. Promote climate-resilient crop varieties to reduce yield losses.
2. Expand irrigation coverage and implement efficient water management practices.
3. Encourage crop diversification to minimize climate-related risks.
4. Strengthen crop insurance schemes for timely and adequate compensation.
5. Increase government investment in agricultural research and climate-smart technologies.
6. Improve agricultural extension services to spread awareness about adaptation strategies.
7. Provide accurate weather forecasting and early warning systems.
8. Enhance financial and institutional support for small and marginal farmers.

Conclusion:
Climate change has emerged as a serious threat to agricultural output and farm income, particularly in developing and agrarian economies. Rising temperatures, erratic rainfall patterns, and frequent extreme weather

events have reduced crop productivity, increased production costs, and created income instability for farmers. The study concludes that small and marginal farmers are the most vulnerable due to their heavy dependence on climate-sensitive agriculture and limited adaptive capacity. However, adoption of climate-resilient farming practices, supported by effective government policies, agricultural research, and institutional assistance, can significantly reduce the adverse impacts of climate change. Strengthening climate-smart agriculture is essential for ensuring sustainable agricultural growth, food security, and stable farm incomes in the long run.

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Original Article

Gender Dynamics And Power Structures in John Masters' Portrayal of Colonial Society

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Abstract
This research paper examines the intricate relationship between gender dynamics and imperial power structures in the novels of John Masters, focusing on how the British Raj utilized patriarchal and racial hierarchies to maintain dominance in colonial India. By bridging postcolonial feminist theory with Foucault's framework of power-knowledge, the study analyzes the domestic colonial bungalow as a micro-administrative space that mirrored broader political governance. It evaluates the dual-layered authority of the colonial "Sahib," the intensive surveillance and moral policing imposed upon British women, and the exoticization or pathologization of indigenous and Anglo-Indian women, such as the Rani of Kishanpur and Victoria Jones. Furthermore, the paper investigates how female transgression, crises of colonial masculinity during the twilight of the empire, and cross-racial complicity exposed the internal structural frailties of British rule. Ultimately, Masters' multi-generational narrative reveals that private domestic control and public imperial subjugation operated as interdependent apparatuses of colonial hegemony.

Keywords: *John Masters, Colonial Society, Gender Dynamics, Power Structures, Postcolonial Feminism, British Raj*

Introduction

Background and Context

The history of British colonial rule in India is a vast narrative of political domination, administrative control, and cultural exchange. For nearly two centuries, the British Raj established a complex machinery of governance designed to maintain supremacy over millions of local inhabitants. This imperial structure was not merely maintained through military force and economic exploitation; it relied heavily on social codes, racial divisions, and strict behavioral norms. Within this historical landscape, literature written by British authors who lived or served in India offers a unique window into the psychological and social realities of the empire. Among these writers, John Masters holds a prominent and distinct place. As a member of a family that had served in the Indian Army for generations, and having served himself as a decorated officer in the Gurkha Rifles before India gained independence in 1947, Masters possessed firsthand experience of the institutions he wrote about. Masters is best known for his multi-generational fictional saga centered around the Savage family, which spans centuries of Indian history from the early days of British expansion to the turbulent period of partition and decolonization. Novels such as *Nightrunners of Bengal*, *The Deceivers*, and *Bhowani Junction* vividly capture the shifting moods of colonial society. While his plots often feature high-stakes historical events—such as the Indian Rebellion of 1857 or the final chaotic months of the British presence in 1946—his work goes far beyond simple adventure or historical retelling. Masters delves deeply into the private lives, secret fears, and moral dilemmas of both the British colonizers and the colonized Indians.

Problem Statement

Traditionally, critical evaluations of colonial literature focus heavily on macro-level political interactions, racial binaries, and the mechanics of imperial administration. Scholars often examine how the British state exercised control through laws, police forces, and military might. However, this broad focus frequently overlooks the intimate, everyday spaces where power is actually negotiated.

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In John Masters' novels, imperial authority is deeply entangled with the private domestic sphere, traditional gender roles, and complex sexual politics. The problem addressed in this paper is how Masters illustrates that public imperial dominance cannot be separated from private gender dynamics. The control of land and government is mirrored by the control of households, bodies, and social relationships, creating a dual system of oppression and negotiation.

Theoretical Framework

To properly analyze these themes, this study utilizes postcolonial feminist theory, drawing upon the foundational insights of thinkers like GayatriSpivak and Chandra TalpadeMohanty, alongside Michel Foucault's theories on power and knowledge. Foucault argued that power is not merely top-down or held exclusively by a government; rather, it circulates through everyday social institutions, surveillance mechanisms, and cultural norms. In a colonial context, this means that power operates just as powerfully in the drawing room, the bedroom, and the social club as it does in the Viceroy's council chamber. Postcolonial feminist theory expands on this by examining how gender and race intersect in colonial settings. Scholars like Mohanty have pointed out how Western discourses often universalize or misrepresent women of the Global South, while Spivak's work questions whether the subaltern woman can truly speak within dominant patriarchal and imperial frameworks. Applying these lenses to John Masters' work allows us to uncover how British women, indigenous Indian women, and Anglo-Indians were all positioned differently within the machinery of the British Raj, and how their subjugation or occasional resistance served the interests of empire.

Literature Review

Critical Reception of John Masters

The critical reception of John Masters has evolved significantly over the decades. When his novels were first published in the mid-twentieth century, they were widely celebrated for their vivid historical realism, gripping storytelling, and deep insider knowledge of Indian landscapes and military customs. Reviewers praised Masters for his ability to capture the sights, sounds, and tensions of a changing subcontinent. Because he was born in India and served in the British Indian Army, early readers often viewed his books as authentic historical records written by an empathetic observer who understood the complexities of the East. However, as postcolonial literary criticism gained momentum in the late twentieth century, scholars began to re-evaluate Masters' work with a more critical eye. Critics noted that while Masters was often sympathetic to individual Indians and critical of certain bureaucratic shortcomings of the British administration, his overarching narrative framework often relied on conventional imperial tropes. Some analyses argued that his works romanticize imperial nostalgia, presenting the ultimate collapse of the British Raj as a tragic loss of order and purpose rather than the liberation of an occupied people. Despite these debates, recent scholarship recognizes that Masters' novels provide a rich, complex psychological portrait of colonial anxiety, making them a fertile ground for studies on identity, race, and gender. Gender and Race in Colonial Discourse In the broader field of colonial and postcolonial studies, extensive research has been conducted on how gender and race intersect to uphold imperial systems. Historians and literary critics have demonstrated that nineteenth- and twentieth-century British imperial literature systematically codified the ideology of the 'White Man's Burden.' This ideology was built upon a paternalistic foundation: the British male was cast as the rational, strong protector responsible for civilizing a chaotic and emotional native population. Within this dynamic, European women were placed on a pedestal as symbols of racial purity and moral virtue, requiring constant protection from perceived external and internal threats. Conversely, indigenous women were frequently subjected to dual forms of marginalization. They were often either exoticized as mysterious objects of sexual desire or dismissed as backward and oppressed by their own traditional cultures. This binary allowed colonial powers to justify their presence by claiming they were rescuing native women from local patriarchal abuses, while simultaneously enforcing their own strict patriarchal and racial hierarchies. Literature from the colonial era reflects these exact ideological anxieties, serving as a cultural laboratory where racial boundaries and gender roles were tested, reinforced, and occasionally contested.

Identification of the Research Gap

While previous scholarship has thoroughly examined the general themes of race and political power in British imperial fiction, there remains a noticeable gap concerning how John Masters specifically integrates micro-level gender negotiations with macro-level imperial structures across his multi-novel saga. Much of the existing criticism tends to treat gender as a secondary background element behind the major historical conflicts like wars and rebellions. This paper seeks to bridge that gap by placing gender at the very center of the analysis, demonstrating that in Masters' fictional world, the management of the empire and the management of gender roles are essentially two sides of the same coin.

The Domestic Sphere as a Microcosm of Imperial Power

The British Household and Bureaucratic Control

In John Masters' fictional universe, the colonial bungalow is much more than a simple private residence; it functions as a micro-administrative unit that mirrors the broader political governance of the British Raj. The physical layout of the bungalow—with its segregated living quarters, army of domestic servants, and defensive distance from the local native town—creates an enclosed bubble of British order in the middle of an unfamiliar and often overwhelming foreign environment. Every aspect of household management, from the strict timing of meals to the rigid hierarchy among the servants (such as the cook, the butler, and the sweeper), reflects the bureaucratic obsession with order, classification, and control that characterized the colonial state. Within these walls, the British characters attempt to recreate a miniature version of Victorian or twentieth-century British society. This domestic routine acts as a psychological defense mechanism against the chaos and unpredictability of India. The household becomes a testing ground for

authority, where the ability of the British master and mistress to maintain order in their kitchen and living room is viewed as a direct reflection of their ability to govern the district outside. Thus, domestic discipline and political power are intimately linked, turning the private home into an outpost of empire.

The 'Sahib' Archetype and Paternalistic Authority

The male protagonists in Masters' novels—such as Rodney Savage in *Nightrunners of Bengal* or William Savage in earlier historical installments—embody the classic archetype of the colonial 'Sahib.' These men are defined by a strong sense of duty, military discipline, and an absolute belief in their right to rule. However, their authority is dual-layered: they exercise absolute command over their native subordinates, soldiers, and local populations, while simultaneously acting as patriarchal sovereigns over their wives, sisters, and daughters. This paternalistic authority is presented by Masters as both a heavy burden and a source of deep personal pride. The Sahib views himself as a stern yet benevolent father figure to the colonized people, believing that they require firm guidance. At the same time, this same paternalistic mindset governs his family relationships. Women in the household are expected to defer to his judgment, accept his protection, and embody the respectable values of the home country. When native subordinates or female family members question this authority, it is treated not merely as a personal disagreement, but as a dangerous threat to the entire hierarchy upon which colonial stability depends.

Surveillance and the Policing of Behavior

Because the British community in India lived as a tiny minority surrounded by a vast native population, maintaining social cohesion and racial prestige was a matter of utmost urgency. In Masters' novels, this pressure creates an intense culture of surveillance and social policing, which falls disproportionately upon British women. European women in colonial society were assigned the heavy responsibility of acting as the moral guardians of the empire. Any deviation from strict codes of respectable behavior, modesty, or racial decorum was met with severe social ostracism. Masters illustrates how club life, gossip, and rigid social etiquette acted as invisible prison walls for colonial women. They were constantly watched by their peers to ensure they did not cross racial boundaries, show emotional weakness, or undermine the perceived moral superiority of the ruling race. This constant policing demonstrates that while British men held formal political and military power, women were heavily conscripted into maintaining the cultural and ideological frontlines of the Raj.

Gendered Othering: Representations of Indigenous and Anglo-Indian Women

The Exoticization and Victimization of Native Women

The representation of indigenous women in John Masters' novels reveals the complex ways in which colonial literature constructs the 'Other.' Characters such as the Rani of Kishanpur in *Nightrunners of Bengal* embody the dual impulses of the colonial gaze: simultaneous attraction and repulsion, desire and fear. On one hand, native women are often portrayed through exoticized lenses, highlighting their physical allure, traditional jewelry, and palaces. On the other hand, when these women display political ambition, intelligence, or independence, they are quickly pathologized and depicted as dangerous, deceptive, or irrational. The Rani, for instance, is a powerful historical figure caught in the sweeping violence of the 1857 Rebellion. Masters portrays her with a mixture of fascination and skepticism. Her political agency—her desire to protect her kingdom and resist British annexation—is often filtered through a male British perspective that struggles to reconcile traditional Indian female subservience with active political leadership. Through such characters, Masters highlights how native female agency is consistently undermined or viewed through a suspicious colonial lens, reflecting the broader imperial anxiety regarding native rebellion and self-rule.

The Politics of Hybridity

Perhaps one of Masters' most thorough explorations of gender and racial identity occurs in *Bhowani Junction*, particularly through the character of Victoria Jones. As an Anglo-Indian woman living in India during the final months before independence in 1946, Victoria finds herself caught at the exact intersection of conflicting racial hierarchies, patriarchal expectations, and shifting national identities. Anglo-Indians occupied an ambiguous social space in colonial society: they were neither fully accepted as British peers by the colonial rulers nor fully integrated into Indian society. Victoria's personal journey—her romantic and cultural dilemmas as she interacts with British officers, Indian nationalists, and her own Anglo-Indian community—serves as an allegory for the broader political crisis of decolonization. Her body and her choices become a battleground where different social orders compete for dominance. Masters uses Victoria's struggles to expose the rigid prejudices of both the departing British elite and the emerging Indian political leaders, illustrating how hybrid identities disrupt neat racial and gender classifications.

Sexual Violence and Imperial Anxiety

A recurring motif in colonial historical fiction is the looming threat of sexual violence, particularly the fear of European women being violated by native men during times of rebellion. In *Nightrunners of Bengal*, this anxiety forms a central emotional driver for the narrative. Masters explores how the spectre of sexual assault is weaponized within colonial discourse to justify harsher military crackdowns, reinforce racial solidarity among the British, and solidify the myth of the protective white male hero. However, Masters also complicates this trope by examining the actual violence suffered by women on all sides during times of upheaval. He portrays how war and rebellion expose women—both British and Indian—to physical danger, while male leaders use the rhetoric of female honor to mask political failures and inflame racial hatred. By laying bare these psychological fears, Masters reveals the deep-seated paranoia that underpinned the physical power of the British Empire.

Subversion and Resistance: Fractures in Colonial Power Structures

Female Transgression against Imperial Norms

Despite the heavy social policing and rigid expectations of colonial society, John Masters populates his novels with female characters who occasionally step outside accepted boundaries. Whether it is a British woman questioning the racial prejudices of her husband or an Indian woman asserting her independence in a patriarchal court, these acts of transgression reveal the hidden fragility embedded within seemingly monolithic power structures. When individuals refuse to play their assigned roles in the imperial script, the stability of the entire social system is temporarily called into question. These transgressive moments demonstrate that colonial authority was never absolute or uncontested. Even within the most tightly controlled households and administrative districts, personal desires, forbidden romances, and moral doubts created internal fractures. Masters uses these plotlines to show that human relationships frequently complicate and undermine rigid political ideologies, proving that absolute power is constantly undermined by everyday human realities.

The Crisis of Masculinity during Decolonization

As the historical timeline of Masters' saga moves toward the mid-twentieth century and the twilight of the British Raj, his novels depict a profound crisis of British masculinity. In early novels, male protagonists derive their confidence from unquestioned military dominance and administrative authority. However, by the time of *Bhowani Junction* in 1946, the ground is shifting rapidly. The impending departure of the British, the rise of Indian nationalism, and the changing role of women leave male characters struggling to find their purpose. This crisis of masculinity mirrors the institutional decay of the empire itself. When military force is no longer sufficient to maintain control, and when traditional paternalistic justifications for rule fall apart, male authority becomes defensive, confused, and obsolete. Masters captures this poignant transition, showing how the crumbling of political power goes hand in hand with the collapse of traditional patriarchal self-assurance.

Complicity and Collaboration

Power structures in Masters' novels are also maintained or challenged through complex alliances that cross racial and gender divides. Colonialism was never simply a binary struggle between all British people and all Indians; it relied heavily on local collaboration, administrative intermediaries, and social compromises. Masters explores how gendered alliances—such as friendships between British and Indian women, or romantic entanglements across racial lines—both reinforce and disrupt the status quo.

These relationships highlight the moral ambiguity of the colonial encounter. Characters are frequently forced to choose between personal loyalty and political duty, between individual affection and racial solidarity. Through these nuanced portrayals, Masters avoids simplistic hero-villain binaries, offering instead a realistic depiction of how colonial power structures maintained themselves through a web of complicity, negotiation, and compromise.

Conclusion

This research paper has explored how John Masters weaves gender constructs into the machinery of colonial dominance, demonstrating across his novels that the personal is inherently imperial. By examining the domestic bungalow as a micro-administrative unit, analyzing the paternalistic 'Sahib' archetype, and investigating the surveillance of British women, the text reveals how private life was heavily weaponized to support public imperial authority. Furthermore, the study of indigenous and Anglo-Indian women—such as the Rani of Kishanpur and Victoria Jones—highlights the complex ways in which gender and race intersected to create layers of exclusion, exoticization, and identity crisis.

Ultimately, Masters' literary saga exposes the systemic frailties of the British Raj through its heavy reliance on strict gender and racial policing. While the empire projected an image of unbreakable strength and eternal order, its actual survival depended on fragile domestic routines, paranoid surveillance, and the suppression of individual human freedom. As historical pressures mounted toward decolonization, both political authority and patriarchal masculinity fractured under the strain. Masters' work remains a valuable literary archive because it captures not only the grand historical events of the subcontinent but also the intimate psychological battlegrounds where empire was lived, sustained, and ultimately undone.

Future research in this field could expand upon these findings by undertaking comparative postcolonial readings of John Masters alongside other mid-twentieth-century Anglo-Indian and Indian English writers, such as E.M. Forster, Paul Scott, or Kamala Markandaya. Additionally, further investigations into how contemporary gender and queer theories intersect with late-colonial literature will continue to enrich our understanding of how historical fiction constructs identity, power, and resistance in the shadow of empire.

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Conflicts of interest

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Substantive Equality and Menstrual Leave Policies in India: An Article 14 Analysis

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Abstract:

Menstrual leave keeps coming up when people talk about workplace equality and how labour laws can be more sensitive to gender issues. Right now, Indian labour law doesn't officially recognize menstrual leave—even though periods really do affect both the physical and mental health of a large chunk of the workforce. Because there's no clear policy, different companies, public institutions, and even state governments treat the issue in their own way. That's left a lot of people wondering if they're getting fair access to decent working conditions. When you look at the issue through Article 14 of the Indian Constitution—which promises everyone equality before the law—it becomes clear that menstrual leave isn't just a workplace concern. It's actually a constitutional one. This analysis explores how ignoring the biological realities around menstruation affects people's chances at work. It asks whether brushing off or refusing to acknowledge the need for menstruation leave actually leads to unfair treatment of those who menstruate. The study argues that real equality at work isn't just about treating everyone the same on the surface; the law sometimes requires thoughtful accommodations to level the playing field. The essay looks at whether menstruation leave fits into this idea — if it's something the constitution actually allows as a reasonable accommodation, not just special treatment — by analysing legal texts, court rulings, and gender equality principles. The study finds that a strong menstrual leave policy—one that actually protects women from discrimination and stereotypes at work—can make India's commitments to health, dignity, and fair employment more real. It goes a step further, saying if you really want workplace justice in India to feel compassionate and complete, you have to look at equality under Article 14 in a more nuanced way. Equality shouldn't just erase differences; it needs to recognize them without pushing people further behind.

Key words: *Menstrual Leave; Substantive Equality; Article 14; Workplace Equality; Gender Justice; Constitutional Law; Labour Rights; Workplace Dignity; Reasonable Accommodation; Indian Constitution.*

Introduction:

Menstruation isn't just a private issue anymore; countries are finally seeing it as something tied to workplace fairness, medical concerns, and dignity. The idea of menstrual leave keeps popping up in public debates and legal discussions. Some governments and companies are starting to question if their current labour laws genuinely assist employees who cope with menstruation. Still, even with all this talk about menstrual health and fair employment practices, India hasn't locked anything down legally. Without a national law on menstrual leave, workers in India mostly rely on whatever their company decides or small, scattered efforts by individual states. It's uneven, and plenty of people get left out India's employment rules tend to act like everyone at work is the same, even though that's just not true. Take menstruation—tons of people deal with it on the job, but most workplaces pretend it's just a private matter, not something they need to address. Because of that, a lot of workers end up powering through pain, fatigue, or other health problems with zero real support. And it's not just about the physical side of things. There's also the old stigma surrounding periods, which keeps people from talking openly or pushing for better laws. Honestly, if we actually care about equality, we've got to see that fairness at work means more than just treating everyone exactly the same. It's about understanding what different people go through and creating rules that reflect that reality. Looking at menstruation leave through the lens of Article 14 in India's Constitution, you can see just how important it is. Over time, our idea of what equality means has shifted. We're not stuck with the old "treat everyone exactly the same" mind-set.

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Instead, we're starting to see the bigger picture—how structural disadvantages and social realities shape people's lives.The truth is, generic workplace policies that seem fair on paper often hit menstruating employees much harder. That's why this new way of thinking matters. Substantive equality isn't afraid of treating people differently if that's what fairness actually needs. Sometimes, unequal treatment is the only way to level the playing field and make sure everyone can fully participate in society. There's a deeper constitutional clash involved within the discussion on the topic of menstrual leave. On one side, critics say these policies might actually hurt women by feeding the stereotype that they're less capable or reliable at work, which could lead to more discrimination in hiring. On the other hand, supporters argue that making employees fit into workplace standards built without considering their real, lived experiences leaves some people behind and quietly keeps discrimination in place. So the big question is: Is period leave a necessary step toward real equality and respect at work, or is it just special treatment?[1] The Supreme Court keeps coming back to one core idea: dignity lies at the heart of the right to life and personal liberty under Article 21[2]. At the same time, courts have started looking at equality in a new light—not just as a shield against obvious discrimination, but as a tool to break down deep-rooted disadvantages. So, when you think about menstrual leave, it's not just another workplace perk. It's really about making citizenship and the workplace more inclusive, and pushing for real equality. In this evolving constitutional landscape, menstrual leave stands out as a matter of dignity, equal participation, and justice—not just a basic labour policy. To figure out if menstrual leave is actually about promoting real equality—not just handing out special privileges—this article dives into how India handles such policies, especially looking at Article 14 and how substantive equality works. The author believes giving everyone the exact same treatment isn't always fair. Sometimes, you have to make reasonable accommodations to ensure people can truly participate and feel respected at work. The study examines whether menstrual leave can stand up constitutionally as a tool for substantive equality, rather than just a perk. It looks at core legal principles, how courts think about these issues, and the bigger picture about workplace accommodations.

Research Questions:

This study looks at how menstrual leave policies fit into India's broader conversation about equality in the workplace. Sure, the Constitution says everyone gets equal treatment at work, but it doesn't say much about how employers should handle something as common as menstruation. Because of that silence, many so-called "neutral" workplace rules end up making life harder for people who menstruate—even though that wasn't the original intention. The research digs into whether leaving out menstrual leave really undermines equality by ignoring how biology shapes participation and dignity on the job. In short, it questions if treating everyone the same on paper actually leads to unfairness in practice, especially when it comes to menstrual health.[3] This study examines whether menstrual leave fits with Article 14 of the Indian Constitution, which deals with equality. The big question is: is offering menstrual leave, which targets health issues specific to women, a fair move within the constitution, or does it break the principle of equal treatment? The debate isn't just about treating everyone the same—it's about whether real equality means addressing different needs to make outcomes and opportunities fair for everyone. Courts have started to shift in this direction. Instead of insisting on strict sameness, they're recognizing that genuine equality sometimes requires special accommodations.[4] Cases like Anju Garg v. Hotel Association of India (2008) and Navtej Singh Johar v. Union of India (2018) really highlight this change. The heart of the matter is figuring out whether menstrual leave counts as a legitimate way to support substantive equality or if it just sidesteps equal treatment. With the legal landscape evolving, this question is getting more and more attention.[5] Accommodation-based policies can help make workplaces more inclusive, but they also spark worries about biased hiring, unfair opportunities, and the risk of locking people into old-fashioned gender roles. This study looks at whether menstrual leave actually pushes us closer to real equality, or if it just ends up painting women as less capable at work. People still wrestle with whether such policies offer genuine protection or just lead to patronizing discrimination—something courts have struggled with, like in the Air India v. Nargesh Meerza case from 1981. There's a constant push and pull between the intent to protect and the danger of reinforcing those very stereotypes accommodation is supposed to fix.[6] The study looks at whether interpreting Articles 14 and 21 through the lens of dignity can help build a system of reasonable accommodation—one that pushes for inclusive employment and keeps gender-based classifications from being abused, as discussed in the Suchita Srivastava v. Chandigarh Administration (2009) case. It explores how constitutional courts should weigh equality and dignity against issues like workplace stereotyping and discrimination. The paper digs into whether this kind of dignity-focused approach really backs a framework that supports inclusion in jobs while shutting down unfair gender-based distinctions.[7]

Hypothesis:

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1 See *Air India v. Nargesh Meerza*, (1981) 4 S.C.C. 335 (India).

2 *Suchita Srivastava v. Chandigarh Admin.*, (2009) 9 S.C.C. 1 (India).

3 See INDIA CONST. art. 14; *Anuj Garg v. Hotel Ass'n of India*, (2008) 3 S.C.C. 1 (India).

4 See *Anuj Garg v. Hotel Ass'n of India*, (2008) 3 S.C.C. 1 (India)

5 See *Anuj Garg v. Hotel Ass'n of India*, (2008) 3 S.C.C. 1 (India); *Navtej Singh Johar v. Union of India*, (2018) 10 S.C.C. 1 (India);

6 Air India v. Nargesh Meerza, (1981) 4 SCC 335 (India).

7 Suchita Srivastava v. Chandigarh Administration, (2009) 9 SCC 1 (India).

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Women who menstruate often face extra challenges at work that others don't. India's absence of universal menstrual leave makes it harder to achieve true equality, as promised by Article 14 of the Constitution. This isn't about discrimination—it's about giving reasonable accommodations for menstruation, which the Constitution allows as fair and necessary different treatment.

Research Methodology:

To explore whether menstrual leave policies line up with the Indian Constitution, this study looks closely at legal texts and court decisions. It doesn't rely on surveys or real-world data—instead, it zeroes in on how constitutional ideas, especially substantive equality from Article 14, connect to menstrual leave at work. The doctrinal method fits perfectly here since the research breaks down judicial reasoning and examines the legal framework for workplace equality. By focusing on legal documents, court rulings, and policy guidelines, the study digs into how these principles actually affect menstrual leave in employment.[8] This research really dug into various legal documents. We looked at the actual words of the Constitution concerning equality, dignity, and how to protect certain groups—things like Articles 14, 15(3), and 21 of the Indian Constitution.[9] We also studied what the Supreme Court of India decided in cases about gender fairness, discrimination at work, the spirit of the constitution, and achieving real equality.[10] On top of that, we examined labour policies, government talks around menstrual leave, and any proposed laws for making workplaces more suitable. Those constitutional articles (14, 15(3), and 21), which talk about equality, dignity, and protection, are prime examples of the main sources we used. The paper also often brings up the Supreme Court of India's decisions on issues such as gender justice, unfair treatment at work, constitutional principles, and true fairness. To really grasp the current legal landscape in India, we made sure to study labour laws, government debates concerning menstrual leave, and different ideas for new workplace accommodation laws. This study looks at how other countries handle menstrual leave and similar laws. We do this to get a wider view and understand things better, not to just copy what they do. Instead, we want to find ideas for laws and policies that could help shape India's equality laws. Our research uses two main ways of looking at things: normative and analytical. The normative part tries to figure out if, based on our constitution's idea of equality, companies should make reasonable adjustments for employees who menstruate. This would be to ensure everyone gets fair treatment and feels respected at work. When it comes to workplace adjustments for menstruation, the analytical part of our study examines our current constitutional rules, how courts have interpreted them, and where there are gaps in the law.[11] By using both these approaches, the study hopes to add to the ongoing discussion in India about labour rights that are sensitive to gender, and about equality under the constitution.

Conceptual Framework: Formal Equality vs. Substantive Equality:

It's hard to comprehend the whole constitutional debate about menstrual leave without first understanding the difference between formal and substantive equality. Over time, Indian equality law has shifted. It doesn't just treat everyone the same way anymore — instead, it looks at the bigger picture: people's backgrounds, real-world challenges, and the uneven playing field many face. This shift matters a lot when you're talking about workplace policies affecting employees who menstruate. That distinction between just equal treatment on paper and real, lived equality makes all the difference.[12]

Formal Equality:

Equalities under formal fairness imply taking care of everyone equally regardless of the persons social economic or cultural background. In essence the concept requires that all individuals follow the rules within an organization. This implies that equality in terms of treatment would result in impartiality. Thus in a workplace where formal equality prevails all employees have to abide by the rules despite any disparities such as health conditions and biological aspects. This model might look fair at first glance but it often misses how people's experiences at work really aren't the same. When policies try to treat everyone exactly alike they can actually end up hurting groups who don't fit the usual workplace mold sometimes, because of social differences, sometimes because of biology. Take menstruation, for example if fairness just means embracing all people equally that kind of thinking ignores the real physical discomfort, health problems and social stigma that menstruating employees deal with every month. So even when everything looks equal on paper some people still end up losing out. [13]

Substantive Equality:

Substantive equality digs deeper than just treating everyone the same. It's about making sure people actually have equal chances and can really participate, not just pretending things are fair on the surface. So instead of focusing on what looks "neutral," it asks if some groups are getting a raw deal or need extra support to level the playing field. Sometimes, that means recognizing real differences—whether it's biological or structural—and adjusting the approach. If those changes help fix disadvantages instead of making inequality worse, differentiated treatment makes sense. More and more, India's fundamental document has backed this powerful idea of equality. The top judicial body keeps pushing for an interpretation of Article 14 that goes

[8] See INDIA CONST. art. 14; *Anuj Garg v. Hotel Ass'n of India*, (2008) 3 S.C.C. 1 (India).

[9] INDIA CONST. arts. 14, 15(3), 21.

[10] See *Anuj Garg v. Hotel Ass'n of India*, (2008) 3 S.C.C. 1 (India); *Navtej Singh Johar v. Union of India*, (2018) 10 S.C.C. 1 (India); *Suchita Srivastava v. Chandigarh Admin.*, (2009) 9 S.C.C. 1 (India).

[11] See *Navtej Singh Johar v. Union of India*, (2018) 10 S.C.C. 1 (India); *Anuj Garg v. Hotel Ass'n of India*, (2008) 3 S.C.C. 1 (India).

[12] INDIA CONST. art. 14; *Anuj Garg v. Hotel Ass'n of India*, (2008) 3 S.C.C. 1 (India).

[13] *Air India v. Nargesh Meerza*, (1981) 4 S.C.C. 335 (India).

beyond just formal sameness. Instead, they want it to promote inclusion, dignity, and real access to rights. Over time, judges have shifted the way they read the Constitution—they concentrate on defending personal freedom and breaking down old, exclusionary practices. They get that true equality isn't just about treating everyone exactly the same; it's about recognizing people's real experiences and making sure the law reflects that.[14]

From a different viewpoint, menstruation leave may not be considered as a sort of advantage, but instead as a reflection of equal opportunity of the sort allowing people who have some types of physical limitations to take part in professional activities fairly. This means that accommodation- based equality recognizes the necessity to change certain aspects of working environment in order for people affected by some biological conditions to be treated equally in terms of having access to certain employment opportunities. Instead of assuming incompetence, this approach implies the acceptance of biological realities and ensuring that people are not discriminated against based on their natural processes. Menstruation ntinues to be stigmatized and overlooked at work despite the fact that it affects a significant number of workers. Without reasonable accommodations at work, female employees might have to perform their charge under circumstances that are detrimental to their productivity and health. Given this, it is suggested by a substantive equality framework that in order to achieve equality of opportunities, participation, and dignity at work, workplace justice must be informed by awareness of existing inequalities rather than only equal treatment.[15]

Constitutional Framework:

In assessing the constitutional validity of menstrual leave laws in India, the overarching doctrine of equality, dignity, and social justice given by the Constitution must be taken into account. The Constitution not only prohibits discrimination but also provides the basis for creating a transformative justice system with an aim to correct both systemic and historical injustices. When interpreting the Constitution with respect to menstruation one must strike a balance between the need to accommodate biological conditions that can hinder equal access to work and the principle of equality. A constitutional basis for determining whether the provision of menstruation leave constitutes a means of substantive equality or an unlawful means of preferential treatment can be found in the joint interpretation of the Articles 14, 15(3), and 21.[16]

Article 14: Equality Before Law and Equal Protection of Laws:

Article 14 talks about legal identically along with fair protection. It says that instead of treating everyone exactly the same, the law can make reasonable classifications.[17] These classifications are okay as long as they're based on authentic variations and correspond to the goal. Essentially, endeavouring to render diverse elements equal can actually create inequality. So, if a distinction doesn't help someone who is disadvantaged or doesn't set up general rules to give everyone a fair chance, it doesn't break the rule of legal impartiality. The notion of capriciousness has gained significance within Indian constitutional jurisprudence, especially regarding Article This indicates, even if a government action doesn't seem like it's discriminating between groups, if it lacks fairness, reasonableness, or proportionality, it can be challenged.[18] The highest court has said many times that unjustifiable behaviour conflicts with rule-based governance along with impartiality, additionally that fairness and subjectivity can't exist together. For example, a strict workplace policy about menstruation might need to be looked at to see if it unfairly burdens certain employees, given the biological realities they face.

Article 14 stipulates the state should ensure people are accorded equal status both in law and in practice. When laws or rules unintentionally put certain people at a disadvantage, the courts now often say that reasonable adjustments might be needed to achieve real equality. So, instead of being an unfair advantage, something like menstruation leave could be viewed as a way to help make sure everyone can participate equally in their jobs, which supports the idea of substantive equality.[19]

Article 15(3): Protective Discrimination and Special Provisions for Women:

Even though all individuals ought to be subjected to equal treatment, Article 15(3) allows the government to create exceptional regulations for females and minors. The reason is that sometimes we need to take extra steps to fix differences caused by biology or past unfairness, so that everyone can truly be equal. The Constitution's Article 15(3) means that giving people fair workplace accommodations for things like menstrual leave can help ensure fair chances and respect, as long as it doesn't just reinforce old ideas about gender.[20]

Article 21: Dignity, Health, and Bodily Autonomy:

Article 21 upholds the entitlement to life and individual freedom, which comprises human dignity, well-being, personal privacy, and body sovereignty. Keeping this in consideration, period leave may be seen as a legal provision which supports employees experiencing menstruation be

[14] *Navtej Singh Johar v. Union of India*, (2018) 10 S.C.C. 1 (India)

[15] INDIA CONST. arts. 14, 21; *Navtej Singh Johar v. Union of India*, (2018) 10 S.C.C. 1 (India).

[16] INDIA CONST. arts. 14, 15(3), 21.

[17] *State of W. Bengal v. Anwar Ali Sarkar*, A.I.R. 1952 S.C. 75 (India); *Budhan Choudhry v. State of Bihar*, A.I.R. 1955 S.C. 191 (India).

[18] *E.P. Royappa v. State of Tamil Nadu*, (1974) 4 S.C.C. 3 (India); *Maneka Gandhi v. Union of India*, (1978) 1 S.C.C. 248 (India).

[19] *Anuj Garg v. Hotel Ass'n of India*, (2008) 3 S.C.C. 1 (India); *Navtej Singh Johar v. Union of India*, (2018) 10 S.C.C. 1 (India).

[20] INDIA CONST. art. 15(3); *Gov't of A.P. v. P.B. Vijayakumar*, (1995) 4 S.C.C. 520 (India).

fully involved at their jobs while ensuring protection of both health and dignity.[21]

1. Existing Legal Position in India:

India's legal system for menstrual leave is inconsistent because there isn't a nationwide rule that lets employees take time off for their periods[22]. While women in Bihar have had special leave for this for a long time, there are no similar legal protections across the country. [23]Some companies have started offering menstrual leave voluntarily as part of their employee wellness initiatives, but these are not required by law.[24] Attempts to create a formal system for menstrual leave, like the Menstruation Benefit Bill, have not become law. Because of this lack of action and varying regulations, access to menstrual accommodations is uneven, depending on the state or employer, instead of being a guaranteed legal right.

2. Findings:

The study points out that current laws don't fully account for the biological factors of the menstrual cycle. This oversight can lead to organizational guidelines that unintentionally disadvantage employees who menstruate.[25] Whereas the idea of "substantive equality" suggests making necessary adjustments for fair participation, just treating everyone the same on paper isn't enough for real inclusion at work[26]. When employees who menstruate have a harder time because their unequal situations aren't acknowledged, not having a standard policy for menstrual leave can end up being a form of indirect discrimination.[27]

3. Recommendations:

India could consider a flexible system for menstrual leave, letting employees take time off when they need it, instead of a fixed rule. This approach could help achieve real equality at work. Any new policy should also have strong protections against discrimination, making sure that taking menstrual leave doesn't hurt someone's chances for hiring, promotions, or career growth. Employers should also offer health accommodations, such as flexible work hours and access to facilities for menstrual hygiene. These measures would support health and well-being in a way that acknowledges individual needs without reinforcing stereotypes.

Conclusion:

Menstrual leave should be thought about in terms of real equality, not just formal equality. A good policy, based on the Indian Constitution, could promote equality, dignity, and inclusion at work by stopping discrimination and providing necessary support.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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[23] See *Menstruation Benefits: Zomato Introduces Period Leave Policy*, *The Hindu* (Aug. 8, 2020) (discussing voluntary menstrual leave policies adopted by private employers).

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Original Article

Youth Engagement in Cooperatives: Perceptions, Barriers, and Technological Innovation Route in Sangli District.

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Abstract

Youth involvement in cooperatives is a critical issue that remains underexplored in the context of inclusive economic and social development. This descriptive theoretical paper explores the structural perceptions of youth towards cooperatives, identifies the microeconomic obstacles hindering their participation, and evaluates opportunities for innovation to revitalize the cooperative movement in Sangli District, Maharashtra, India. Adopting a descriptive conceptual methodology, this study applies a multi-theoretical framework utilizing Path Dependency Theory and Social Capital Theory to analyze the institutional alienation of the younger generation (ages 18–35). The analysis reveals that youth largely perceive cooperatives as outdated, structurally rigid, and politically closed entities. The paper maps out structural, programmatic, and policy reforms by conceptualizing the integration of digital innovations, platform cooperativism, and youth-centered governance models. This comprehensive transformation is essential not only to attract the interest of the younger generation but also to maintain the long-term sustainability and relevance of cooperatives in an era of rapid socio-economic change.

Keywords: *Cooperation, Descriptive Research Framework, Path Dependency, Youth Involvement, Policy Interventions, Sangli District.*

Introduction

The issue of generational sustainability in economic and social leadership remains a significant challenge globally. Although the cooperative movement has historically been a driver of regional development, contemporary cooperatives struggle to retain demographic relevance among younger generations. In the context of the social economy, particularly in developing agrarian regions like Western India, youth representation in cooperative decision-making structures is low, despite cooperatives often being seen as inclusive and democratic models.A report by the International Labour Organization (ILO, 2023) revealed that integrating young professionals into social cooperatives tends to bring a more participatory, digital, and community-oriented managerial approach. In many agrarian corridors, youth-inclusive cooperatives demonstrate higher levels of structural modernization and broader social impact compared to traditional, stagnant cooperatives. However, they still face deep-rooted structural barriers, such as generational biases, geriatric leadership retention, and limited access to targeted innovation resources. The cooperative sector in India forms the backbone of the rural economy, operating as a distinct institutional model that balances commercial sustainability with social equity. Originating formally with the Cooperative Credit Societies Act of 1904, the movement expanded dramatically post-independence to protect vulnerable agrarian communities from exploitative informal credit networks. Today, India boasts one of the largest cooperative networks in the world, spanning primary agricultural credit societies (PACS), marketing federations, and large-scale consumer cooperatives. Despite its vast reach, the national cooperative ecosystem is undergoing a modern transition, increasingly pressured to adapt to digital frameworks and integrate a younger demographic to counter structural stagnation.

The Cooperative Movement in Maharashtra

Maharashtra represents the vanguard of the Indian cooperative movement, demonstrating how collective enterprise can drive state-level socio-economic development. Guided by the Maharashtra Co-operative Societies Act of 1960, the state established a powerful network of cooperative sugar factories (*Sahakari Sakhar Karkhanas*), spinning mills, and district central cooperative banks (DCCBs).

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The Localized Reality of Sangli District Cooperatives

Sangli's sahakari (cooperative) network wasn't just built on paper—it was built on the sweat of local stalwarts who wanted to pull farmers out of the grip of greedy middlemen and build true rura self-reliance. Ground zero of this transformation was set up by Padmabhushan Vasantdada Patil, affectionately remembered across Maharashtra as Dada. He founded the iconic Shetkari Sahakari Sakhar Karkhana right in Sangli. To make sure farmers didn't have to beg for capital, Dada, alongside Yashwantrao Chavan, nurtured the Sangli District Central Co-operative (SDCC) Bank, turning it into the financial lifeline of the region.Over in the Walwa belt, Rajarambapu Patil took the co-op spirit to heart by starting the Walwa Taluka Sahakari Sakhar Karkhana (later renamed after him). He didn't stop at sugar—he linked it with doodh (dairy), lift-irrigation, and schools to lift up entire villages. Right alongside him, freedom fighter Hutatma Nagnathanna Naikwadi established the Hutatma Kisan Ahir Sahakari Sakhar Karkhana, showing everyone how a co-op could be run with absolute honesty while putting small shetkaris (farmers) and factory workers first.Down in the Kadegaon region, Dr. Patangrao Kadam stepped up to found the Sonhira Sahakari Sakhar Karkhana, completely changing the picture for a drought-prone belt through sugar production and power generation. These visionary leaders—our true Sahakar Maharshis—didn't just build factories and patsansthas (credit societies); they gave Sangli's rural folks the confidence to run their own destiny.

Statement Of Need

Sangli district's 3,117 cooperative societies face an urgent sustainability crisis driven by aging leadership and technological obsolescence. Furthermore, the complete structural absence of dedicated youth, vocational, or women's cooperatives leaves younger generations excluded from local governance. Because empirical research on youth perceptions, institutional barriers, and digital solutions at the district level remains scarce, this study fills a vital knowledge gap. Ultimately, it offers actionable pathways to revitalize traditional societies into modern, youth-led, and technologically advanced economic engines.

Objectives Of The Study

1. To describe and analyze the prevailing perceptions and institutional attitudes of modern youth (aged 18–35) toward the cooperative sector in Sangli District.
2. To identify and classify the core socio-political, structural, and technological barriers that impedes active youth participation and leadership succession within these entities.
3. To evaluate the strategic opportunities for innovation, digital transformation, and social entrepreneurship that can align the cooperative model with modern youth capabilities.
4. To formulate actionable policy suggestions and programmatic recommendations to foster a youth-inclusive governance ecosystem within regional cooperatives.

Methodology

To maintain methodological clarity, this section outlines the research design, data collection methods, and analytical procedures used in this study.

4Research Design- This study utilizes a Descriptive Theoretical Research Design. Descriptive research aims to accurately depict the characteristics, behaviors, and institutional conditions of a specific phenomenon—in this case, youth interaction with the cooperative ecosystem in Sangli District. Rather than testing statistical data through field surveys, this paper employs theoretical synthesis to describe structural relationships, institutional barriers, and generational perceptions.

Method of Data Collection & Sources- The research relies on secondary qualitative data and institutional document analysis. Sources include -
Institutional Reports like, District Cooperative Department reports, Annual Financial Performance Reviews of Sangli District Central Co-operative Bank (SDCCB), and Primary Agricultural Credit Societies (PACS) records. Policy Charters like a The Maharashtra Co-operative Societies Act (1960) and national policy circulars from the Ministry of Cooperation, Government of India and also Academic Literature like a Peer-reviewed journals covering cooperative governance, rural youth entrepreneurship, and social economics.

Method of Analysis- The collected qualitative and institutional data are analyzed using Qualitative Conceptual and Thematic Analysis.

Geographical Focus and Scope - The geographical scope is restricted to the agricultural and semi-urban talukas of Sangli District (such as Miraj, Tasgaon, Walwa, Shirala, and Khanapur). The demographic focus centers on young adults aged 18–35 years living within these agrarian corridors.

Sector wise breakdown of cooperatives in Sangli district –

Sangli district features a robust network of 3,117 registered cooperatives societies across various sectors.

Sr. No.	Cooperative Sector\ Sub-category	Number of Societies	Percentage of Total (%)
1.	Primary agriculture Credit Society	750	24.06%
2.	Credit and Thrift society	639	20.50%
3.	Dairy Cooperative	460	14.76%

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4.	Labour cooperative	381	12.22%
5.	Agriculture and allied cooperatives	225	7.22%
6.	Agro processing \ Industrial cooperatives	198	6.35%
7.	Multipurpose cooperative	126	4.04%
8.	Fishery Cooperative	100	3.21%
9.	Housing Cooperative	24	0.77%
10.	Marketing Cooperative Society	23	0.74%
11.	Consumer cooperative	14	0.45%
12.	Livestock and Poultry Cooperative	10	0.32%
13.	Sugar mills cooperative	9	0.29%
14.	Urban cooperative Bank	7	0.22%

(*cooperative.gov.in*)

Ground Reality -

An empirical analysis of Sangli district's 3,117 registered cooperatives exposes a critical structural misalignment between the traditional cooperative framework and contemporary youth aspirations. Over 71.5% of societies remain concentrated in traditional sectors—specifically Primary Agricultural Credit Societies (750), Credit & Thrift (639), Dairy (460), and Labour (381)—focused on legacy credit disbursement and basic commodity pooling rather than modern skill-based enterprise. Crucially, the institutional registry reveals a complete structural void: there are zero registered cooperatives dedicated to youth welfare, educational and vocational training, or specialized women's empowerment. Beyond this institutional gap, existing societies are trapped in aging leadership and a severe tech lag. Decision-making bodies remain tightly controlled by senior leaders, creating invisible walls that block younger members from having a voice. Without cloud accounting or digital platforms, most sahakari societies still rely on dusty manual ledgers, leading tech-savvy rural youth to view them as outdated relics rather than modern places to build a career.

Economic Concepts And Theoretical Approaches

Core Economic Concepts in Cooperativism

The Theory of the Commons: Cooperatives operate as collective resource systems where assets are owned democratically. In economic terms, minimizing transaction costs while avoiding the "tragedy of the commons" requires high institutional trust and clear generational succession rules.

Principal-Agent Asymmetry: Within Sangli's cooperatives, a distinct principal-agent problem emerges where the entrenched management (the agents) prioritize long-term political or personal tenure over the innovative economic demands of the broader community membership (the principals), particularly the younger stakeholders.

Analytical Theoretical Framework

The study evaluates the institutional landscape of Sangli by synthesizing two complementary theoretical paradigms:

Social Capital Theory (Putnam): Robert Putnam distinguishes between *Bonding Social Capital* (exclusive, inward-looking networks) and *Bridging Social Capital* (inclusive, outward-looking networks). Traditional cooperatives in Sangli rely heavily on tight bonding social capital built among veteran agrarian founders. While this cohesion was vital for early trust, the systemic lack of *bridging* social capital prevents cooperatives from connecting with the younger, digitally networked generation.

Path Dependency and Lock-In (Pierson):

This theory posits that once an organization commits to a specific institutional path, self-reinforcing mechanisms make deviation from that path highly difficult. Sangli's cooperative sector suffers from systemic institutional lock-in. The bureaucratic processes, manual bookkeeping, and patronage networks that brought immense success in the 20th century are now the very elements that prevent these institutions from adapting to modern market dynamics, such as e-commerce, digital fintech, and decentralized platforms that appeal to the youth.

Discussion: Barriers, Perspectives, And Contributions

Youth Perceptions and the Modern Identity Crisis

A conceptual analysis reveals a sharp gap in expectations between the younger generation and the current cooperative model. The perception that cooperatives do not offer sufficient career opportunities reflects a profound lack of innovation in developing young talent within cooperative organizations. Youth largely view cooperatives as institutions that have experienced a decline in relevance, particularly in the face of the emerging digital startup ecosystem. The younger generation grows up looking for organizations that are dynamic, open to new ideas, and provide opportunities for rapid,

merit-based growth—attributes they often do not find in traditional cooperatives. However, not all youth perceptions are negative. There remains a significant opportunity to restore and strengthen the cooperative image by repositioning these entities as spaces for social innovation, sustainable development, and local economic resilience. Youth recognize the potential of cooperatives as a platform for social entrepreneurship, especially in high-value organic agriculture, shared cold-chain logistics, and creative regional food processing.

Structural and Systemic Barriers to Entry

The most prominent structural barrier identified within this descriptive framework is the lack of institutional entry points for youth to develop professionally within cooperative structures. Most cooperatives in Sangli retain rigid, traditional management models that are deeply hierarchical and do not provide enough room for new ideas from young members.

For the younger generation, accustomed to rapid change and adaptive startup cultures, the stagnant cooperative model is considered unattractive. These barriers highlight the need for internal structural reforms within the cooperative, including adjustments to leadership styles, the development of youth-specific programs, and the creation of more collaborative and agile participatory spaces. Without these updates, cooperatives risk losing the regeneration potential of their members, which is so much needed for long-term sustainability.

Opportunities for Innovation and Contribution

This research reveals that cooperatives have a great opportunity to transform into an attractive innovation platform for youth through the use of digital technology and community-based approaches. The adoption of digital platforms to manage memberships, e-commerce-based marketing systems, and community crowdfunding schemes can make cooperatives more responsive and competitive in the digital age. Technology can also be utilized to expedite decision-making processes, enhance organizational transparency, and broaden the reach of cooperatives into new market segments. In addition, the design of innovative programs, such as entrepreneurial incubators within cooperatives, is one of the key strategies to attract young people. These incubators can provide real opportunities for young members to develop socially based business projects, get mentorship from senior members, and expand their professional networks. Cooperatives that can play a role as an ecosystem of learning and innovation will be better able to maintain the relevance and regeneration of their members. Collaboration with local startup systems, universities, and creative communities can also enhance the positioning of cooperatives as a hub that fosters innovation and cross-generational collaboration.

Policy And Strategic Alignment

To secure long-term viability, Sangli's cooperatives must align with modern national and state-level development policies. This includes integrating cooperative modernization initiatives with the national *Sahakar se Samriddhi* (Prosperity through Cooperation) vision, leveraging institutional credits from the National Cooperative Development Corporation (NCDC), and utilizing rural digitisation grants. Structuring cooperative transformations around these policy pathways ensures that local entities receive the financial and regulatory support required to build modern, compliant infrastructure capable of attracting professional youth talent.

Suggestions And Recommendations

Based on the descriptive theoretical analysis, the following systemic suggestions are proposed to revitalize the cooperative sector in Sangli District:

1. **Institutionalize Junior Boards:** Cooperatives should establish shadow "Junior Boards of Directors" for members under 35, providing them with real executive management training and operational budgets.
2. **Mandate Age Quotas:** Advocate for legislative amendments within the Maharashtra Co-operative Societies Act to introduce mandatory seats for youth on senior executive councils.
3. **Transition to Platform Cooperativism:** Deploy integrated digital applications for membership management, credit processing, and crop supply logistics to eliminate paper bureaucracy.
4. **Establish Cooperative Incubators:** Partner with regional educational institutions (like Shivaji University) to build business incubators focused on cooperative models and modern agribusiness.
5. **Launch Direct-to-Consumer (D2C) Brands:** Encourage youth-led sub-cooperatives to brand and market high-value organic products directly to metropolitan centers via digital marketplaces.
6. **Re-brand the Cooperative Identity:** Restructure public communication frameworks to promote cooperatives as ethical, sustainable social enterprises that match modern youth values.
7. **Introduce Financial Incentives:** Design low-interest equity loans and targeted micro-credit schemes exclusively for young entrepreneurs launching cooperative start-ups.

Conclusion

This study reveals a stark reality: youth in Sangli district are stepping away from sahakari (cooperative) institutions, viewing them as rigid, old-school, and lacking growth compared to modern corporate careers. Built decades ago by visionaries like Vasantdada Patil and Rajarambapu Patil, these cooperatives now struggle with aging leadership and slow digital updates, making them feel out of touch with today's tech-literate generation. Yet, Sangli's cooperative spirit isn't dead—it just needs a modern

reboot. By embracing digital tools, supporting youth-led agri-entrepreneurship, and upgrading grassroots bodies like Primary Agricultural Credit Societies (PACS), cooperatives can easily reconnect with the youth. Giving young local minds a real seat at the table will ensure these institutions stay dynamic, sustainable, and relevant. Moving forward, comparing Western Maharashtra's co-op models with other regions and studying digital PACS setups will offer actionable roadmaps to keep our historic sahakari movement thriving for generations to come.

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Conflicts of interest
The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Original Article

Impact of Social Media Marketing on Consumer Engagement and Adoption in Banking Services – Indian Banking Sector.

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Abstract

The fast-changing nature of Indian financial environment has required a strategic change towards the traditional advertising to Social Media Marketing (SMM) to spur consumer interest and adoption of digital services. This paper examines how SMM activities, such as content strategy, brand trust, social influence, and the interactivity influence the uptake of digital banking services, such as UPI and mobile apps, in the Indian banking industry. Using descriptive research design, data were gathered via primary data, comprising 300 active bank users using a structured questionnaire on the Likert scale. Pearson Correlation and Multiple Linear Regression were used to analyze the data. The findings show that the model is highly significant ($F = 1925.951$, $p < .001$) and SMM predictors are able to explain 96.3% of the variance of consumer adoption ($R\ 2 = .963$). An almost perfect relationship was found between the pace of customer service in social media (interactivity) and the rate of mobile banking utilization (.976). Besides, educational content (mu 3.87) and social brand trust (mu 3.88) turned out to be the most powerful factors of engagement. Although Finfluencer effect was observed to be moderate, the overall outcome shows that the main factors propelling financial migration are high-trust, responsive digital ecosystems. The paper concludes that Indian banks need to focus on real-time social interactivity and vernacular educational content in order to be competitive in a world of growing globalization. Such results provide important lessons to the marketing strategists who seek to improve the financial inclusion and digital literacy in a progressively cashless economy.

Keywords: *Social Media Marketing, Digital Banking Adoption, Consumer Engagement, Indian Banking Sector, Financial Interactivity.*

Introduction

With its digital revolution, the Indian banking environment has been transformed fundamentally, shifting away from its old format of brick and mortar to a hyper-connected digital platform. Social media marketing (SMM) in this regard has become a vital instrument that banks can use to negotiate the challenges posed by a new economy. Onuorah et al. (2022) emphasize that the impact of SMM on the brand engagement of the customer is strong because it establishes interactive environment that would be impossible to achieve through the conventional channels. This interaction is not simply cosmetic in the Indian banking industry; it is a strategic must to survive in a competitive market (Sanil, 2023). The move towards digitization in retail banking in South Asia underscores an increase in customer engagement being directly proportionate to moving to financial products (Kowsar et al., 2025; Mohiuddin et al., 2025). To Indian banks, social media is an avenue to create brand equity. Hafez (2021) stresses that SMM activities contribute to increased brand trust and love, the key mediators of long-term customer relations. Sawhney et al. (2022) also support this idea by stating that social media has become a critical component of creating a digitally capable society by educating consumers about the use of modern banking tools.

These strategies have been refined by incorporating current technologies in recent research. As an example, Thandapani et al. (2024) show that machine learning models can assist South Indian private banks in enhancing retention by leveraging social media practices. Moreover, Stimulus-Organism-Response (SOR) theory implies that digital features, such as the ones found on web or social sites, serve as stimuli that prompt profoundly psychological response

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(Islam et al., 2020). Corporate Social Responsibility (CSR) communication is becoming more and more a determinant of this engagement.Sharma (2024, 2025) points out that Indian government banks use CSR on social media to increase the consumer-brand recognition and promote positive electronic word-of-mouth (eWOM), particularly when regulated by the user-generated content. Nevertheless, the end-point is service adoption. Naeem (2020) offers the evidence that social networking sites produce the social influence required in both traditional and Islamic situations to adopt Internet banking. When comparing such key players as Axis Bank and ICICI Bank, it can be noted that customized mobile engagement plans are the core of transforming social media followers into active mobile banking clients (Sahoo, n.d.; Sawhney et al., 2024). The more chatbots and automated interfaces are used, the greater the antecedents of brand engagement are (Hari et al., 2022). After all, as it was seen with other adjacent countries such as Bangladesh, the main force behind a new consumer behavior and service adoption in the new banking age is social media (Bhuiyan, 2025).

Review Of Literature

Author and Year	**Objective**	**Methodology**	**Key Findings**	**Summary**
Onuorah, C. P., et al. (2022)	To examine the effect of SMM on customer brand engagement in emerging banking markets.	Quantitative study using survey data from bank customers.	SMM dimensions like interaction and trendiness significantly boost brand engagement.	Confirms SMM as a vital driver for customer involvement in emerging economies.
Kowsar, M. M., et al. (2025)	To review digitization trends in South Asian retail banking regarding product adoption.	Qualitative review and secondary data analysis of regional trends.	Customer engagement is the primary bridge between digital presence and product adoption.	Highlights the critical role of engagement in driving digital financial inclusion.
Sanil, N. (2023)	To analyze how SMM influences brand loyalty within the Indian banking industry.	Descriptive research using primary data from Indian bank users.	Consistent social media interaction builds higher trust and long-term brand loyalty.	Establishes a clear link between social media activity and customer retention in India.
Hafez, M. (2021)	To study the impact of SMM on brand equity through trust and brand love.	Structural Equation Modeling (SEM) on banking sector data.	Brand trust and brand love act as key mediators between marketing and equity.	Underscores the psychological emotional factors in social media banking success.
Sawhney, A., et al. (2022)	To explore the evolving role of social media in the Indian banking landscape.	Theoretical framework and case study analysis.	Social media has shifted from a broadcast tool to a strategic engagement platform.	Provides a holistic view of the digital competency transition in Indian banks.
Thandapani, G., et al. (2024)	To understand SMM's role in customer retention using Machine Learning.	ML-based predictive modeling in South Indian private banks.	Targeted social media practices significantly improve customer retention metrics.	Demonstrates the power of AI/ML in optimizing social media marketing outcomes.

Islam, J. U., et al. (2020)	To study website attributes on engagement using Stimulus-Organism-Response theory.	Quantitative analysis using the SOR framework.	Visual and informational website attributes serve as stimuli for deeper engagement.	Links platform quality to the psychological state of the banking consumer.
Sharma, R. (2025)	To evaluate CSR communication on social media and its impact on eWOM.	Quantitative study with moderating effect of User-Generated Content.	CSR communication on social media fosters brand identification and positive word-of-mouth.	Proves that social responsibility content enhances a bank's digital reputation.
Bhuiyan, Z. H. (2025)	To investigate how social media influences consumer behavior in banking.	Empirical study focusing on consumer decision-making paths.	Social media reviews and peer interactions are now primary influencers of behavior.	Identifies social platforms as the new "word-of-mouth" for financial decisions.
Sawhney, A., et al. (2024)	To examine bank performance on social platforms using an SEM approach.	SEM analysis of performance metrics across various social platforms.	Effective social media management directly correlates with overall bank performance.	Validates that social media efficiency translates into organizational success.
Hari, H., et al. (2022)	To examine customer engagement through AI chatbots on bank websites.	Empirical analysis of chatbot interactions and user outcomes.	Chatbots enhance the speed of engagement and improve service satisfaction.	Focuses on automated engagement as a future pillar of digital banking.
Naeem, M. (2020)	To develop antecedents for internet banking adoption via social networks.	Qualitative research using evidence from Islamic and conventional banks.	Social influence and peer recommendations on networks trigger digital adoption.	Highlights the "social" aspect of social media in driving tech adoption.
Sahoo, R. (n.d.)	To compare digital marketing strategies of Axis Bank and ICICI Bank.	Comparative case study and mobile engagement analysis.	Targeted mobile-centric marketing leads to higher app downloads and usage.	Shows that competition in SMM drives innovation in Indian digital banking.

Research Gap

Although the role of social media in the brand equity and customer engagement has been already extensively researched, there is a research gap that needs to be addressed by quantifying the direct conversion between the passive engagement and active adoption of particular digital products such as the CBDC and Neo-banking services in the Indian context. Moreover, little empirical data exists on the specific effect of vernacular social content on the level of trust of Tier 2 and Tier 3 Indian consumers.

Research Design

Statement Of The Problem

The Indian economy is rapidly becoming digitalized and traditional and modern banks have been compelled to abandon traditional advertising and embrace Social

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Media Marketing (SMM). Nevertheless, even with high levels of digital penetration, banks find it difficult to translate the social media "engagement" into a real service adoption because of the underlying concerns about the safety of data and impersonal character of digital platforms. This research is conducted to fill the gap between brand presence and trust to consumers online. There is need to determine whether SMM is an effective way of making high-value banking decisions or just a redressal tool. The primary goal is to find out what SMM strategies, including influencer partnerships or regional content, are usable in switching a casual follower to a loyal digital banking user and eventually allow banks to better maximize their marketing ROI.

Objectives

1. To study the impact of social media marketing content (educational vs. promotional) on consumer engagement levels in the Indian banking sector.
2. To assess the relationship between social media brand trust and the actual adoption of digital banking services like UPI, mobile apps, and online credit.

To find out the key demographic factors (age, income, and region) that influence the effectiveness of social media marketing in banking.

Research Methodology

The method used in the present study is systematic because it attempts to explore the relationship between marketing activities and consumer behavior in a way that the results of the research are not only statistically valid but also practical to the banking sector. The best design to be applied in this study is a Descriptive Research design. It permits an objective and true depiction of consumer perceptions and interaction patterns without influencing the variables. It offers information on what the current trends are in Indian banking SMM and how they influence consumer adoption by different demographics.

Sources Of Data

Primary Data: This will be gathered via the researcher in a structured digital questionnaire. The information will be collected through the direct sample of 300 recognized participants who are active users of bank accounts and social media, namely, to use this study. **Secondary Data:** This incorporates published data on RBI annual reports, financial journals and marketing publications. It is also the examination of the already available articles, official websites of the banks and prior scholarly work to establish a theoretical groundwork of the study.

Sampling Plan

Sample Unit: The individuals within the banking system of India that own at least one bank account and use one or more financial institution on social media.

Sample Size: To guarantee statistical significance, 300 responses will be obtained.

Sampling Technique: Convenience Sampling: The convenience sampling will be employed to access active digital users effectively across various age groups and regions.

Data Collection Tools

Survey: A questionnaire will be conducted in a form of a structured questionnaire along a 5-point Likert Scale (Strongly Disagree to Strongly Agree) to measure the consumer attitudes and engagement levels.

Observation: The researcher will observe official social media accounts of leading Indian banks and see how the consumer interacts in real-time and the response rates.

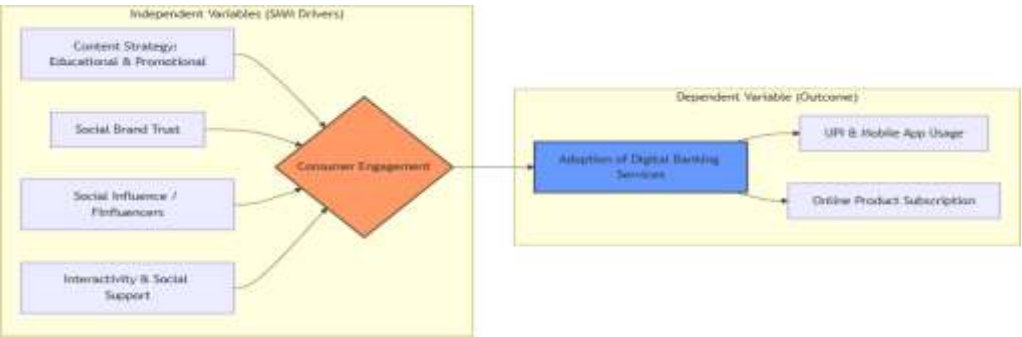
Research Design: The research design will be a focus group consisting of brief moderated conversations with 8-10 common digital banking users to understand the perceptions of trust and security qualitatively.

Plan Of Analysis

The data obtained will be organized and tabulated to make sure that they are accurate. This will be analyzed using **Descriptive Statistics** to provide a summary of the profiles of the respondents, and **Correlation and Regression Analysis** will be conducted using MS Excel and SPSS to examine the effects of SMM on the adoption of the services. Lastly, the conclusions will be made based on the results and inferred to make meaningful conclusions.

Conceptual Framework

Independent Variables (IV):



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Content Strategy (Educational vs. Promotional): **The type of information shared (e.g., security tips vs. loan offers).**

1. **Social Brand Trust:** The level of credibility a bank establishes through verified profiles and transparent communication.
2. **Social Influence (Finfluencers):** The impact of third-party financial influencers on consumer perception.
3. **Interactivity (Customer Support):** The responsiveness of the bank to queries via platforms like X (Twitter) or WhatsApp.Dependent Variable (DV):
4. **Consumer Adoption of Digital Banking Services:** The actual transition to using UPI, mobile apps, and online financial products.

Results

Hypothesis (H1): There is a significant positive impact of Social Media Marketing (SMM) activities (educational content, brand trust, and influencer engagement) on the adoption of digital banking services among Indian consumers.

Null Hypothesis (H0): There is no significant impact of Social Media Marketing (SMM) activities on the adoption of digital banking services among Indian consumers.

Regression Analysis

Variables Entered/Removeda			
Model	Variables Entered	Variables Removed	Method
1	How satisfied are you with the speed of customer service provided by banks through social media channels (X/WhatsApp) compared to traditional branch visits?, Recommendations or reviews from "Finfluencers" (Financial Influencers) influence my choice of choosing one bank over another., I trust a bank more if it has an active, verified social media presence with high follower engagement., Educational content (e.g., security tips) from banks on social media makes me feel more confident about using their digital services.b	.	Enter
a. Dependent Variable: My frequency of using mobile banking apps has increased because of the regular updates and feature tutorials I see on social media.			
b. All requested variables entered.			

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.981a	.963	.963	.212

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ANOVAa						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	345.680	4	86.420	1925.951	.000b
	Residual	13.237	295	.045		
	Total	358.917	299			

a. Dependent Variable: My frequency of using mobile banking apps has increased because of the regular updates and feature tutorials I see on social media.

b. Predictors: (Constant), How satisfied are you with the speed of customer service provided by banks through social media channels (X/WhatsApp) compared to traditional branch visits?, Recommendations or reviews from "Finfluencers" (Financial Influencers) influence my choice of choosing one bank over another., I trust a bank more if it has an active, verified social media presence with high follower engagement., Educational content (e.g., security tips) from banks on social media makes me feel more confident about using their digital services.

a. Predictors: (Constant), How satisfied are you with the speed of customer service provided by banks through social media channels (X/WhatsApp) compared to traditional branch visits?, Recommendations or reviews from "Finfluencers" (Financial Influencers) influence my choice of choosing one bank over another., I trust a bank more if it has an active, verified social media presence with high follower engagement., Educational content (e.g., security tips) from banks on social media makes me feel more confident about using their digital services.

Coefficientsa						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.024	.050		-.469	.639
	Educational content (e.g., security tips) from banks on social media makes me feel more confident about using their digital services.	.216	.063	.204	3.435	.001

	I trust a bank more if it has an active, verified social media presence with high follower engagement.	.099	.061	.095	1.627	.105
	Recommendations or reviews from	-.008	.028	-.008	-.280	.780

	"Finfluencers" (Financial Influencers) influence my choice of choosing one bank over another.					
	How satisfied are you with the speed of customer service provided by banks through social media channels (X/WhatsApp) compared to traditional branch visits?	.697	.033	.706	21.025	.000
a. Dependent Variable: My frequency of using mobile banking apps has increased because of the regular updates and feature tutorials I see on social media.						

1.2 Correlation

Correlations					
	Content Strategy (Educational vs. Promotional	Social Brand Trust	Social Influence (Finfluencers)	Interactivity (Customer Support)	Consumer Adoption of Digital Banking Services

Content Strategy (Educational vs. Promotional	Pearson Correlation	1	.980**	.906**	.929**	.945**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	300	300	300	300	300
Social Brand Trust	Pearson Correlation	.980**	1	.907**	.925**	.940**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	300	300	300	300	300
Social Influence (Finfluencers)	Pearson Correlation	.906**	.907**	1	.908**	.903**

	Sig. (2-tailed)	.000	.000		.000	.000
	N	300	300	300	300	300
Interactivity (Customer Support)	Pearson Correlation	.929**	.925**	.908**	1	.976**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	300	300	300	300	300
Consumer Adoption of Digital Banking Services	Pearson Correlation	.945**	.940**	.903**	.976**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	300	300	300	300	300
**. Correlation is significant at the 0.01 level (2-tailed).						

Interpretation

The Pearson Correlation matrix shows the existence of a strong, positive and statistically significant relationship ($p < 0.01$) between all the variables under study on the 300 respondents. The most remarkable result is the extremely high correlation coefficient of.976 between the speed of customer service (X/WhatsApp) and the higher frequency of mobile banking app use, and the next important factor that promotes adoption is real-time responsiveness. Also, the educational content (r =.945) and social brand trust (r =.940) demonstrate almost perfect linear relationships with consumer engagement. These findings affirm that all social media marketing campaigns in the Indian banking industry are highly interwoven, with trust and quality content bringing about digital transformation as a whole.

Descriptive Statistics

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
age group	300	1	4	1.93	.859
monthly household income	300	1	4	2.39	.914
region of India do you currently reside in	300	1	5	2.65	1.342
. Which social media platform do you primarily use to follow or interact with your bank	300	1	5	2.72	1.405

What type of banking content do you find most valuable on social media	300	1	4	2.09	1.065
How often do you engage with a bank's post (Like, Comment, Share, or Save)?	300	1	4	2.55	.918
Which digital banking service did you start using after seeing it on social media	300	1	5	2.27	1.236
Educational content (e.g., security tips) from banks on social media makes me feel more confident about using their digital services.	300	1	5	3.87	1.036
I am more likely to "Like" or "Share" a bank's post if it is in my regional language rather than just English.	300	1	5	3.78	1.099
Promotional offers (e.g., cashback, zero-processing fees)	300	1	5	3.51	1.129
advertised on Instagram/Facebook strongly influence my decision to apply for a bank product					
I trust a bank more if it has an active, verified social media presence with high follower engagement.	300	1	5	3.88	1.049
I feel comfortable sharing my basic contact details on a bank's social media ad to receive a call-back for services.	300	1	5	3.30	1.260

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Recommendations or reviews from "Finfluencers" (Financial Influencers) influence my choice of choosing one bank over another.	300	1	5	3.26	1.157
My frequency of using mobile banking apps has increased because of the regular updates and feature tutorials I see on social media.	300	1	5	3.72	1.096
How satisfied are you with the speed of customer service provided by banks through social media channels (X/WhatsApp) compared to traditional branch visits?	300	1	5	3.65	1.109
Valid N (listwise)	300				

Interpretation

The descriptive statistics of 300 respondents gives a clear picture of what the digital banking scene is like in India. The sample is mainly a young, middle-income population, the heart of the digital transformation in India, with an average age group of 1.93 and a monthly income average of 2.39. The Likert scale items can be analyzed to indicate that the weight of Social Brand Trust is the highest (mu = 3.88) and Educational Content (mu = 3.87) indicate that consumers place more emphasis on credibility and financial literacy. Moreover, the mean of the increased frequency of mobile apps (3.72) is high, which proves that social media is effectively shifting the users to active adaptors of digital banking. Surprisingly, Finfluencer influence (3.26) and being comfortable with sharing contact details (3.30) showed the lowest means. This points to a severe trust gap as far as privacy and third-party advice is concerned. Standard deviations are generally within the range of 1.0 to 1.4, and opinion has a good range of diversity, but the overall tendency is lean towards positive.

Discussions

2. Demographic information reveals that most of the 300 respondents are young people with an average age of 1.93 meaning that it is the young who are the most active in digital banking adoption.
3. The level of household income of the sample is fairly steady with the mean of 2.39 indicating that the middle-income families are now the most active consumers of the modern digital banking services.
4. This explicates the digital banking adoption as the social media marketing model explains a large portion of 96.3 percent of the variance, indicating that these digital strategies are very effective in the Indian market.
5. The researchers discovered that there was almost a perfect positive relationship between the speed of customer service response on social platforms and the real frequency of using the mobile banking app of approximately.976.
6. Social Brand Trust had the most significant average score of 3.88/5; the message here is that validated and operational social media pages are absolutely prerequisite in establishing confidence with consumers in the long run.
7. Educational content was the next most valued with a mean of 3.87 and this indicates that Indian customers are more inclined to posts that are informative than those that are promotional only when they are making decisions to switch to a new banking service.
8. The overall usage frequency of mobile banking apps has been on a rise with a mean of 3.72, a success indicator of an effective shift in the passive following to active and regular digital transaction.

9. The statistically sound and clear rejection of the null hypothesis in this study is the result of the regression analysis whose F-statistic is 1925.951 and the p-value is less than.001.
10. The alternative hypothesis H 1 is accepted, which proves the positive effect of social media marketing on the way Indian consumers use and adopt different banking services to be statistically significant.
11. The content of regional language has a very strong influence with a mean of 3.78, showing that vernacular strategies are becoming a requisite requirement in banks that aim to reach the highly diverse Indian population of states.
12. Overall, the digital adoption is high but the level of comfort with sharing personal contact information on social media advertisements is relatively low with an average score of just 3.30.
13. Finfluencer recommendations had an average of 3.26 and it can be said that even though they are influential, consumers still tend to trust much more official bank channels and authoritative information about institutions.
14. Promotional deals such as the cashback and no processing charges continue to have a robust impact on the choices of consumers with a good average rating of 3.51 out of 300 respondents in the sample.
15. The fact that the values of Pearson correlation are greater than 0.900 in all the variables implies that trust, content, and interactivity are closely interrelated in the complex decision-making process of the consumer in terms of financial products on the Web.
16. The total level of satisfaction with the social media customer service versus physical visits is high at 3.65, which is an indication of a significant change in the way Indian customers would settle their banking issues in the current context.

Conclusion

This research finds that Social Media Marketing (SMM) is a revolutionary tool in the Indian banking industry and this is changing the way people interact and embrace financial services. The sample of 300 respondents provides empirical data that a strong positive relationship exists and the regression model accounts 96.3 percent of the variation in the digital service adoption ($p < .001$). This study was able to dismiss the null hypothesis and prove that such strategic digital interventions as the high quality of the educational material and the quick interactivity through the application of such platforms as WhatsApp and X are the key factors in transforming passive consumers into active users of mobile banking and UPI products. Moreover, the results also highlight the fact that although promotional offers are the quickest to attract attention, Social Brand Trust and Educational Content are rated as the most important drivers (mu > 3.8) as it is clear that Indian consumers are more focused on other elements of security and financial literacy rather than on incentives. The almost flawless correlation between speed of customer service and adoption frequency (.976) confirms that responsive, human-digital hybrid model is the future of retail banking. Finally, this paper will conclude that the Indian banks have to go beyond the vanity measures and concentrate on creating a high-trust, vernacular-friendly digital ecosystem that will enable the younger generation to spearhead the process of transforming India into a fully cashless economy.

Suggestions

1. To sustain the extremely high correlation between the speed of the service and the adoption of mobile apps, Indian banks should invest heavily in real-time AI-powered chatbots and social response teams.
2. Marketing departments should change their main emphasis to developing quality learning videos that can clarify difficult financial terms to gain a stronger consumer trust and consumer loyalty to the brand.
3. In order to reach the broader audience in Tier 2 and Tier 3 cities, banks will need to adopt hyper-localized content strategies, which would involve using regional languages on all the key social media platforms.
4. Financial institutions should also regularly and effectively communicate their privacy policies and data security on the social media so that the low levels of comfort consumers have with regard to sharing contact details can be improved.
5. Active, well-verified social media accounts that engage actively on a regular basis are essential since it is one of the main measurements that modern consumers use to evaluate institutional trust.
6. It will be necessary to design short, high-impact video tutorials on such platforms as YouTube Shorts and Instagram Reels, where younger users should be guided on how to configure more complex features of mobile banking apps.
7. Although it is possible to reach a wider audience by utilizing financial influencers, banks ought to look at open and controlled deals so that third-party information is strictly adhered to the official bank financial advice.
8. Banks can proactively leverage advanced social listening platforms in order to collect real-time consumer feedback through comments and mentions to continuously optimize their digital product offerings based on the real needs of the user.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Original Article

Holistic Education under NEP 2020: Indian Knowledge Systems, Spiritual Intelligence, Ethics, and Technology

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Abstract

The National Education Policy (NEP) 2020 envisions an Indian education system that is holistic, multidisciplinary, learner-centred, and rooted in indigenous value traditions. This paper examines how Indian Knowledge Systems (IKS), spiritual intelligence, ethics, and technology together operationalise this vision at the classroom level. Spiritual intelligence is treated not as religious instruction but as a culturally grounded capacity for self-awareness, empathy, compassion, purpose, and ethical decision-making, consistent with indigenous frameworks such as the Panchakosha (five-sheath) model of the person. The paper draws on Indian value-education traditions, including the meditation-based Rajayoga pedagogy developed and researched within the Brahma Kumaris educational tradition, as one illustrative Indian model of value and self-development education operating alongside mainstream schooling. It situates these traditions against the growing use of Artificial Intelligence (AI) and digital platforms in Indian classrooms, arguing that technology must remain human-centred and ethically governed. The paper proposes an integrated conceptual framework — IKS and spiritual intelligence, ethics, and technology as three interlocking pillars — and offers recommendations for Indian schools and junior colleges implementing NEP 2020.

Keywords: *Holistic Education, NEP 2020, Indian Knowledge Systems, Panchakosha, Spiritual Intelligence, Rajayoga, Ethics, Educational Technology, Artificial Intelligence.*

Introduction

Education in India has always been understood as more than the transmission of information; it is a means of shaping character, discernment, and social responsibility. In the twenty-first century, rapid technological change, artificial intelligence, climate concerns, and shifting workforce demands have added new urgency to this older Indian understanding of education as vidya — knowledge oriented towards liberation and right action, not merely employment.India's National Education Policy 2020 responds to this moment by explicitly invoking indigenous traditions. The policy calls for the integration of Indian Knowledge Systems (IKS) across levels of education, recognising that India's own philosophical and pedagogical heritage — comprising Jnan (knowledge), Vignan (science), and Jeevan Darshan (philosophy of life) — has long shaped education, ethics, health, and public life on the subcontinent (Integrating India's Traditional Wisdom, 2024). Article 4.23 of NEP 2020 specifically foregrounds Indian Knowledge Systems, while Article 11.1 calls for the integration of traditional Indian values into curricula (Ministry of Education, 2020, as cited in Chatterjee, 2023).Within this indigenous framework, the ancient concept of Panchakosha — the five sheaths of human existence spanning the physical, energetic, mental, intellectual, and bliss dimensions of the person — offers a model of holistic development that predates, and arguably anticipates, contemporary multiple-intelligence theory (Chatterjee, 2023; Integrating Indian Knowledge System with Higher Education, 2026). This paper uses Panchakosha and related Indian value-education traditions, rather than only Western constructs of spiritual intelligence, as the primary lens for holistic education under NEP 2020.A parallel and equally Indian development is the growth of organised value-education movements operating alongside formal schooling. Among these, the Brahma Kumaris Rajayoga tradition — an Indian meditation and self-development system with UN consultative status and a presence in over a hundred countries — has been the subject of a growing body of published Indian research examining its effects on attention, emotional regulation, stress management, and moral development among students and young people (Mehta & Agrawal, 2025; International Journal for Multidisciplinary Research, 2025).

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This paper draws on that literature as one concrete illustration of indigenous value-and-meditation pedagogy that Indian educators can study alongside NEP 2020's own emphasis on well-being and ethics, while treating it as one example among India's many such traditions rather than a prescription for any particular institution. Simultaneously, Artificial Intelligence, adaptive learning platforms, and digital classrooms are transforming Indian education. These tools widen access and personalise learning but raise concerns about data privacy, algorithmic bias, and diminished human interaction. The central argument of this paper is that IKS-grounded self-development, ethical reasoning, and technology are not competing priorities but complementary pillars of the holistic learner NEP 2020 envisions.

Literature Review

Indian Knowledge Systems and NEP 2020

A growing body of Indian scholarship has examined how NEP 2020 operationalises Indian Knowledge Systems. Scholars note that IKS is not peripheral to the policy but foundational to it: NEP 2020 treats indigenous knowledge as a resource for building both globally competitive and culturally rooted graduates (Sharma, 2025; Thakur, 2024, as cited in Indian Knowledge System: A New Perspective, 2026). This literature frames colonial-era marginalisation of indigenous epistemologies as a gap that NEP 2020 seeks to correct through what some scholars term cognitive decolonisation of the curriculum (Indian Knowledge System: A New Perspective, 2026).Within this body of work, the Panchakosha framework has received particular attention as a model that extends educational goals beyond intellectual achievement to physical, emotional, energetic, and spiritual well-being, directly addressing concerns about student stress and burnout in Indian schools (Integrating Indian Knowledge System with Higher Education, 2026). Related scholarship links the traditional Indian emphasis on anubhava (experiential learning) to constructivist learning theory, and situates Vedic and Puranic ecological thought as an antecedent to the environmental education goals of NEP 2020 (Chatterjee, 2023).A related strand of research treats IKS as a foundation specifically for value education in teacher preparation, arguing that India's indigenous philosophical and pedagogical traditions can strengthen moral integrity, professional ethics, and cultural rootedness among practising and prospective teachers (Gaur, 2026). Other work extends this argument to sustainable development, showing how IKS's integration of ethical conduct, environmental stewardship, and spiritual well-being aligns with the value-based paradigm NEP 2020 promotes (Indian Knowledge Systems and Sustainable Human Development, 2026).

Rajayoga and Indian Meditation-Based Value Education

Separate from, but complementary to, the IKS literature is a body of Indian research on organised meditation-based value education, most substantially represented by studies of Brahma Kumaris Rajayoga. This research characterises Rajayoga as a self-management practice rooted in the aim of connecting individual consciousness with a higher moral awareness, associated in published studies with reduced stress, improved emotional regulation, and gains in positive thinking and life satisfaction (Mehta & Agrawal, 2025; Efficacy of Rajayoga Meditation on Positive Thinking, 2013).A 2025 study published in the International Journal for Multidisciplinary Research examined a Rajayoga-based intervention supervised by certified instructors and culturally adapted for Indian adolescents, reporting improvements in attention and concentration, reduced stress and anxiety, and gains in self-esteem and academic performance, and explicitly connected these outcomes to NEP 2020's call for holistic, value-based education incorporating yoga and meditation (International Journal for Multidisciplinary Research, 2025). Other Indian studies report comparable findings among college students and young athletes, including improved self-efficacy and reduced anger among adolescents practising Rajayoga (Jose & Thomas, 2020; TIJER, 2025).

This literature is offered here as one Indian example of how meditation-based value education is being empirically studied within Indian institutions, not as an endorsement of any single organisation's role in formal schooling. It illustrates a broader pattern relevant to NEP 2020: that indigenous self-development practices are increasingly being evaluated using the language and methods of contemporary educational and psychological research.

Ethics and Technology in Indian Education

UNESCO's Recommendation on the Ethics of Artificial Intelligence holds that AI must remain human-centred and grounded in human dignity, inclusion, transparency, and accountability, and calls specifically for AI literacy and ethical awareness within educational institutions (UNESCO, 2021). Within India, researchers similarly argue that AI should function as an educational assistant rather than a substitute for human judgement, and that integrating AI literacy with ethics improves Indian students' moral competence and responsible technology use in ways consistent with NEP 2020's objectives (Holmes et al., 2022).

Research Gap

While Indian scholarship on IKS and NEP 2020 is substantial, and a separate literature evaluates meditation-based value education such as Rajayoga, few studies connect these two indigenous strands with the ethical and technological dimensions of contemporary Indian classrooms. This paper addresses that gap by proposing a single conceptual framework in which IKS-grounded spiritual intelligence, ethics, and technology jointly support the holistic learner envisioned by NEP 2020.

Conceptual Framework

This paper proposes that holistic education under NEP 2020 rests on three interdependent pillars, each with Indian intellectual roots: Spiritual Intelligence, grounded in Indian frameworks such as Panchakosha and illustrated by researched Indian practices such as Rajayoga, which nurtures self-awareness, empathy, purpose, and resilience. Ethics, which supplies the moral

basis for both interpersonal conduct and responsible technology use, drawing on constitutional values as well as Indian ethical traditions (dharma, ahimsa, seva). Technology, which expands access, personalises learning, and supports competency-based assessment, but must remain subordinate to human judgement and Indian pedagogical values. Spiritual intelligence ensures technological advancement remains human-centred; ethics governs its responsible application; and IKS supplies the cultural and philosophical vocabulary — Panchakosha, anubhava, seva — through which Indian classrooms can meaningfully realise NEP 2020's vision, rather than importing an unrooted, generic model of holistic education.

Holistic Education under NEP 2020

NEP 2020 moves Indian education away from rote memorisation and examination-centric instruction towards multidisciplinary, competency-based, and experiential learning. It calls explicitly for the incorporation of Indian Knowledge Systems, arts, vocational education, and technology to develop well-rounded learners (Integrating India's Traditional Wisdom, 2024). The policy's emphasis on constitutional values, environmental awareness, gender sensitivity, and inclusion demonstrates that holistic education, in the Indian policy context, is inseparable from ethical and civic formation.Junior colleges such as AFAC, offering Commerce and Science streams to Classes XI–XII, are well placed to model this integration: interdisciplinary, sustainability-linked project work; NEP-aligned professional development for teachers; and value-based classroom practices can be combined with responsible use of digital and AI tools without any one dimension crowding out the others.

Spiritual Intelligence, IKS, and the Panchakosha Model

The Panchakosha model — describing the physical (Annamaya), vital-energy (Pranamaya), mental (Manomaya), intellectual (Vijnanamaya), and bliss (Anandamaya) sheaths — offers Indian educators a home-grown alternative to imported constructs of holistic development, and has been read by contemporary scholars as anticipating multiple-intelligence theory while remaining rooted in Indian philosophical tradition (Integrating Indian Knowledge System with Higher Education, 2026; Chatterjee, 2023).Within this framework, self-awareness, empathy, and ethical decision-making are cultivated not through religious instruction but through reflective and experiential classroom practices — value-based discussion, service-learning, literary analysis, and, for interested institutions, structured meditation-based programmes. Published Indian research on Rajayoga, for instance, associates regular practice with improved emotional regulation, reduced stress, and stronger self-management among students and young adults, offering one evidence base for how Indian meditation traditions can support the affective and ethical outcomes NEP 2020 seeks (Mehta & Agrawal, 2025; International Journal for Multidisciplinary Research, 2025). Any adoption of such practices in a school setting should remain optional, culturally sensitive, and clearly framed as universal self-development rather than religious instruction, consistent with the secular character of the Indian Constitution and of NEP 2020 itself.

Ethics in the Digital Age

The expansion of AI-powered tutoring, adaptive assessment, and digital classrooms in India has brought ethical questions to the centre of educational practice: academic integrity in the age of generative AI, data privacy for learners whose academic and behavioural data is increasingly collected, and equitable access across India's uneven digital infrastructure. UNESCO's guidance that AI must remain transparent, accountable, and human-centred applies directly to Indian classrooms adopting these tools (UNESCO, 2021), and Indian research suggests that combining AI literacy with explicit ethics instruction strengthens students' responsible use of technology (Holmes et al., 2022).Teachers remain central to this process: modelling responsible technology use, encouraging critical evaluation of AI-generated content, and facilitating discussion of ethical dilemmas prepares Indian learners to be responsible digital citizens rather than passive consumers of technology.

Technology and Artificial Intelligence in Holistic Education

AI-enabled personalisation, multilingual learning tools, and adaptive assessment can meaningfully widen access for Indian learners, including first-generation learners and those with diverse abilities. NEP 2020 treats technology as a strategic resource for quality and inclusion, but is explicit that it must not deepen existing inequalities. Within the framework proposed here, technology is the most recently added of the three pillars and the one most dependent on the other two: without IKS-grounded self-awareness and ethical governance, technological adoption in Indian schools risks efficiency without wisdom.

Recommendations

1. Integrate Panchakosha and other IKS frameworks explicitly into value-education and life-skills components of the curriculum, presented as universal human development rather than religious content.
2. Where institutions choose to explore meditation-based well-being programmes such as Rajayoga, do so on an optional, transparent, and evidence-informed basis, drawing on the published Indian research base.
3. Embed ethics and digital citizenship — academic integrity, data privacy, responsible AI use — across subjects rather than as a standalone module.
4. Provide continuous NEP-aligned teacher training that combines IKS-grounded pedagogy with AI-assisted teaching methods.
5. Adopt AI as a supportive instructional tool that respects transparency, fairness, and learner privacy, never as a substitute for teacher judgement.
6. Design multidisciplinary, sustainability-linked projects — including for Commerce-stream learners — that connect IKS, ethics, and technology in a single learning experience.
7. Develop assessment practices that value creativity, collaboration, ethical reasoning, and social responsibility alongside academic achievement.

Conclusion

NEP 2020's vision of holistic education finds its most authentic expression when grounded in India's own knowledge traditions rather than imported frameworks alone. Indian Knowledge Systems and models such as Panchakosha supply a culturally rooted account of spiritual intelligence; India's growing research literature on meditation-based practices such as Rajayoga offers empirical grounding for their classroom relevance; ethics supplies the moral basis for responsible conduct and technology use; and technology, deployed carefully, extends access and personalisation. Indian educators, policymakers, and curriculum developers share the responsibility of holding these dimensions together, so that learners emerge not only technologically competent but intellectually able, ethically grounded, and rooted in India's own traditions of self-development and service.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Original Article

Social Group-Based Employment Inequalities among Rural Women in India: A special focus on Scheduled Castes

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Abstract

Many women live in Indian rural areas and it is necessary to give them job opportunities to enable this sector to develop. Attaining development of women in the rural setting is paramount and this is done by bridging the difference in employment status that is there among various social classes. Despite the rising rate of employment among rural women, there are still differences in employment participation among women belonging to different social groups. The study will focus on investigating rural women in India in terms of their employment status by social group. The research compares the rate of participation in the labour force (LFPR), the rate of participation by workers (WPR) and the rate of unemployment (UR) of rural women categorized into social groups. This paper will solely be based on secondary data, which is the Annual Report of the Periodic Labour Force Survey (PLFS) 2023-24. The results show that there is an increase in the level of employment of women in 2021-22 and 2023-24. Both LFPR and WPR of women have increased significantly in all social groups. It is important to note that women in Scheduled Tribes (ST) have the highest LFPR and WPR as compared to the other social classes, with women in the Others category having the lowest levels. Although the employment rate of Scheduled Caste (SC) women has also improved, the employment rate of the women is still lower than the ST and OBC. In terms of unemployment, women under the Scheduled Tribes have the lowest rate of unemployment whereas women under the category of Others have the highest. To sum up, despite an increasing employment participation among rural women, there are still inequalities when evaluated within the social groups. A survey of the employment in Scheduled Castes shows that the women are increasingly participating in employment although in this analysis, a large gap is evident in that the participation of women is largely relegated in the unorganised and agricultural sectors, as labourers. To eradicate this inequality, comprehensive policies need to be drafted and enforced that will avail the women to the right education, employment, training and development of the skills.

Keywords: *Labour force participation rate, worker participation rate, unemployment rate, Scheduled Castes and Scheduled Tribes, employment inequality.*

Introduction

In order to realize the socio-economic development of an individual, it is important to offer him/her employment. Since, employment not only brings in revenue and means to fulfill fundamental needs, but also contributes to eliminating poverty and enhancing the quality of the overall economy. Employment plays a very important role in the holistic development of an individual as well as enhancing his or her standard of living and quality of life. In India, employment is particularly important, as it is a critical device in dealing with the key issue in the country; economic inequality. The development of the country is determined by the number of jobs and provision of equal employment opportunities to everyone. However, despite the country's ongoing economic growth, disparities in employment persist across lines of gender and caste-based social groups Factors such as social structure and an individual's social identity—in addition to economic considerations—influence the segmentation of the labor market. Also, factors such as caste, gender, and social group have a bearing on employment opportunities. Studies on employment opportunities across various social groups in India reveal disparities among Scheduled Castes, Scheduled Tribes, Other Backward Classes, and other social groups; marginalized groups often face underrepresentation and inequality in the labor market (Banerjee, 2023).

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Despite constitutional and legal efforts aimed at the economic and social development of India's marginalized communities, they continue to face inequality. This inequality appears to be particularly acute among women, who encounter disparities related to gender as well as social and economic status. Consequently, this results in low labor market participation, limited income, and instability in employment. In India, approximately 405.83 million women live in rural areas (Ministry of Statistics and Programme Implementation (MoSPI), n.d.). Indeed, the majority of women in India live in rural areas, and they play a crucial role in driving economic, environmental, and social changes for sustainable development (UN Women, n.d.). Women contribute not only to fulfilling family responsibilities or increasing household income but also to driving the sustainable development of rural areas. However, despite their participation in rural development, they face challenges regarding education, employment, financial services, and social respect. There has been an increase in the employment of women in rural areas in the last several years. However, this employment is primarily in self-employment or seasonal agricultural labor, sectors characterized by limited income and a lack of adequate job security. Access to quality employment in the non-farm sector requires appropriate education (Shrivastva & Shrivastava , 2010). Despite the contribution of rural women to rural development, significant disparities are evident across social groups regarding access to employment opportunities and participation in the labor market. In India, women's participation in employment is very low, and these women face problems such as gender-caste discrimination, wage gaps, and employment in the unorganized sector in order to find employment. This study examines the Labour Force Participation Rate (LFPR), Worker Participation Rate (WPR), and Unemployment Rate (UR) among women from various social groups in rural India. It attempts to elucidate employment disparities among rural women based on these three indicators, with a particular focus on women belonging to Scheduled Castes. Employment inequality is a broad concept, and an attempt has been made to understand it with the help of the above three indices.

Literature Review

1) Madheswaran and Singhari have analyzed caste-based discrimination faced by regular workers in the private and public sectors within India's urban areas. This study utilizes data from the National Sample Survey Organisation's survey on employment and unemployment and employs the 'decomposition analysis' method to measure the extent of caste-based discrimination. The study reveals that, despite possessing equal qualifications, individuals belonging to Scheduled Castes receive lower wages compared to those from advanced castes, with the level of discrimination being particularly pronounced in the private sector. Education is an effective tool to reduce this discrimination among Scheduled Castes (Madheswaran & Singhari, 2016). 2) Deshpande and Sharma have conducted research on caste-based discrimination in self-employment-based small-scale enterprises in India and its impact on income. Drawing on the 2004-05 India Human Development Survey, the study reveals that the income generated by businesses owned by Scheduled Castes and Scheduled Tribes is significantly lower compared to those owned by non-Scheduled Castes and non-Scheduled Tribes. This difference in incomes also occurs although it is subject to explanation using other variables like educational level, assets and nature of the business thus showing that there is discrimination in the society. Increased income will not be sufficient to decrease discrimination against Scheduled Castes and Scheduled Tribes but multi-dimensional approaches need to be taken (Deshpande & Sharma, 2010). 3) Tanima Banerjee has presented the inequality of employment opportunities among the social groups in skilled professions in India. The question discussed in this research paper is the employment inequality in skilled employment in terms of caste and ethnicity. The data used in the study is the Periodic Labour Force Survey and the non-linear decomposition technique is applied. The result shows that more socially backward classes are not engaged in skilled jobs compared to the higher classes, but this difference in employment is comparatively smaller in the high skilled jobs. In addition, the Indian labour market has a higher number of workers in the low-paying, low-skill positions, which are more concentrated in socially backward classes (Banerjee, 2023). 4) Swaminathan has analyzed the gender and caste based attributes of the Indian rural workforce using the data of PARI'. The study reveals that women's participation in the agricultural sector exceeds that of men; conversely, their participation in the non-agricultural sector appears lower due to familial constraints and a preference for work close to home. The study also indicates an increase in women's participation in employment generated under the MGNREGA scheme. Significant gender-based wage disparities persist in rural areas, and women from Scheduled Castes constitute a substantial portion of the rural female workforce. Providing these women with suitable employment opportunities could lead to an increase in the number of female workers (Swaminathan , 2020).

Objectives

1) To determine the labour force participation rate of women across various social groups in rural India.
2) To study the workforce participation of women across various social groups in rural India.
3) To examine the unemployment rate of women across various social groups in rural India.

Methodology

The present research paper is descriptive and analytical in nature and attempts to examine the employment inequality among women of various social groups in rural India using the indices of Labour Force Participation Rate (LFPR), Worker Participation Rate (WPR) and Unemployment Rate (UR). This study is based entirely on secondary data and uses the 2023-24 Annual Report of the Periodic Labour Force Survey (PLFS). It covers the following social groups: Scheduled Tribes (ST), Scheduled Castes (SC), Other Backward Classes (OBC), and 'Other'.

Result and Discussion

This study analyzes employment inequalities among women across various social groups in rural India. Women in rural areas have limited access to

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employment opportunities and are predominantly engaged in the agricultural sector. Given the existence of diverse social groups in India, this study seeks to determine whether women from these groups have equal access to employment and, if not, to what extent they are employed. Three key concepts—Labour Force Participation Rate (LFPR), Worker Participation Rate (WPR), and Unemployment Rate (UR)—have been utilized to analyze these employment inequalities.

Table No. 1: Labor force participation rate (PLFS) among Rural Women by social group in India, 2021-22 to 2023-24 (in percentage)

Social Groups	PLFS 2021-22	PLFS 2022-23	PLFS 2023-24
ST	40.6	45.2	48.5
SC	26.3	30.6	34.4
OBC	26.4	31.7	35.0
Others	21.5	21.5	29.8
All	**27.2**	**30.5**	**35.5**

Source: Computed by researcher from Annual Report of Periodic Labour Force Survey (PLFS) 2023-24, Ministry of Statistics and Programme Implementation, Government of India.

Figure no. 1

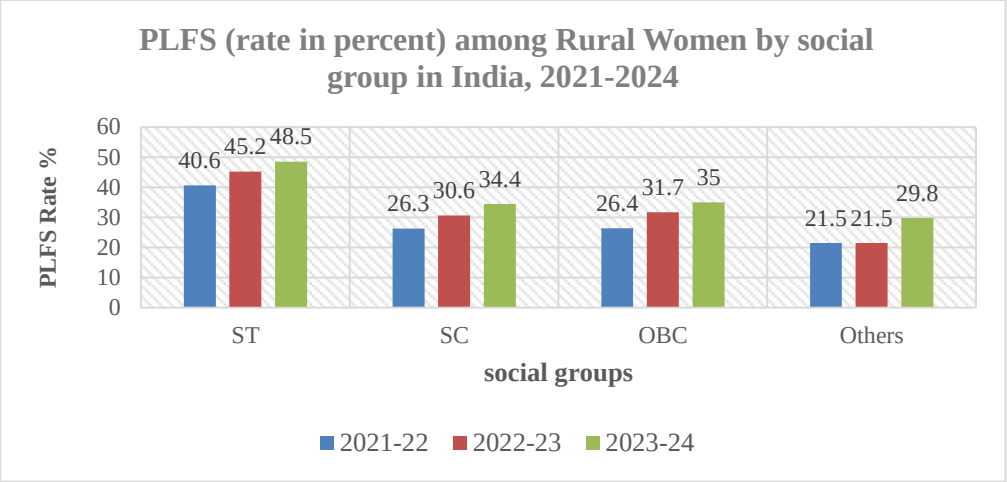

Table no. 1 and figure no. 1 illustrate the Labour Force Participation Rate (LFPR) of rural women across various social groups in India from 2021 to 2024. There is a steady growth in the LFPR between the 2021-22 and 2023-24. Women in the Scheduled Tribes group have the highest LFPR of all social groups with women in the Others category having the lowest participation rate. Next after the category of the other one, the level of participation of women of the Scheduled Castes is the lowest; it was 26.3 in 2021-22 and increased to 34.4 in 2023-24. This rate however, is low compared to the general participation rate of rural women. The results show that, although there is an ongoing increase in the LFPR of rural women in the period between 2021 and 2024, social group differences in this group remain. There was a substantial difference between the rate of participation in the case of women belonging to the Scheduled Tribes and the other groups. Education, employment opportunities, economic status, and availability of jobs in the rural areas may be some of the factors that lead to this inequality. Generally, there is a low percentage of women in the labour force. Inclusive policies are needed to increase this involvement and to provide equal opportunities to women in various social strata in terms of employment.

Table No. 2 Population Ratio of Workers (WPR) of Rural Women by social group in India, 2021-22 to 2023-24 (in percentage)

Social Groups	WPR 2021-22	WPR 2022-23	WPR 2023-24
ST	40.1	44.8	47.9
SC	25.7	30.1	33.7
OBC	25.9	31.1	34.3
Others	20.8	20.8	28.8
All	**26.6**	**30.0**	**34.8**

Source: Due to the cyclical nature of the figure, the researcher computed the mean using the three years of Annual Report of Periodic Labour Force Survey (PLFS) 2023-24.

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Figure no. 2

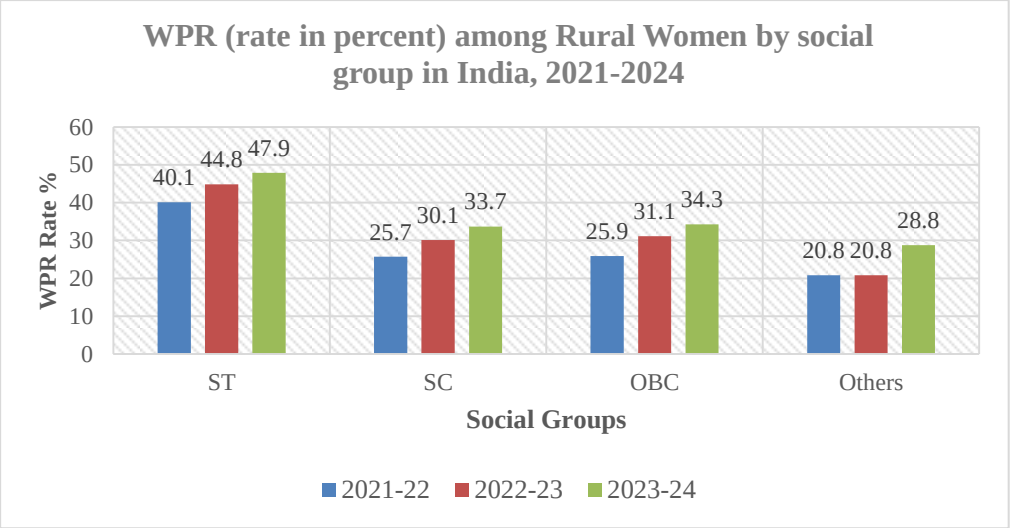

Table 2 and Graph 2 illustrate the workforce participation rate (WPR) of rural women across various social groups in India from 2021-22 to 2023-24. A consistent increase in the workforce participation rate of women was observed between 2021-22 and 2023-24. Women belonging to Scheduled Tribes recorded the highest participation rate; it rose from 40.1% in 2021-22 to 47.9% in 2023-24. During the same period, the WPR for women from Scheduled Castes increased from 25.7% to 33.7%, for women in the OBC category from 25.9% to 34.3%, and for women in the 'Others' category from 20.8% to 28.8%. Additionally, the overall workforce participation rate for rural women rose from 26.6% in 2021-22 to 34.8% in 2023-24. In essence, there has been an increase in the workforce participation rate of women. Although it is clear that the labor force participation rate of women is increasing, there are significant differences in the labor force participation rate of women across social groups, with the participation rate of women from Scheduled Tribes being the highest compared to other groups. This highlights the existence of inequality in the WPR of rural women based on social group affiliation.

Table No. 3: Unemployment rate (UR) among Rural Women by social group in India, 2021-22 to 2023-24 (in percentage)

Social Groups	UR 2021-22	UR 2022-23	UR 2023-24
ST	1.3	1.0	1.2
SC	2.1	1.6	2.0
OBC	2.1	1.8	2.1
Others	3.4	3.1	3.5
All	**2.1**	**1.8**	**2.1**

Source: Computed by researcher from Annual Report of Periodic Labour Force Survey (PLFS) 2023-24, Ministry of Statistics and Programme Implementation, Government of India.

Figure no. 3

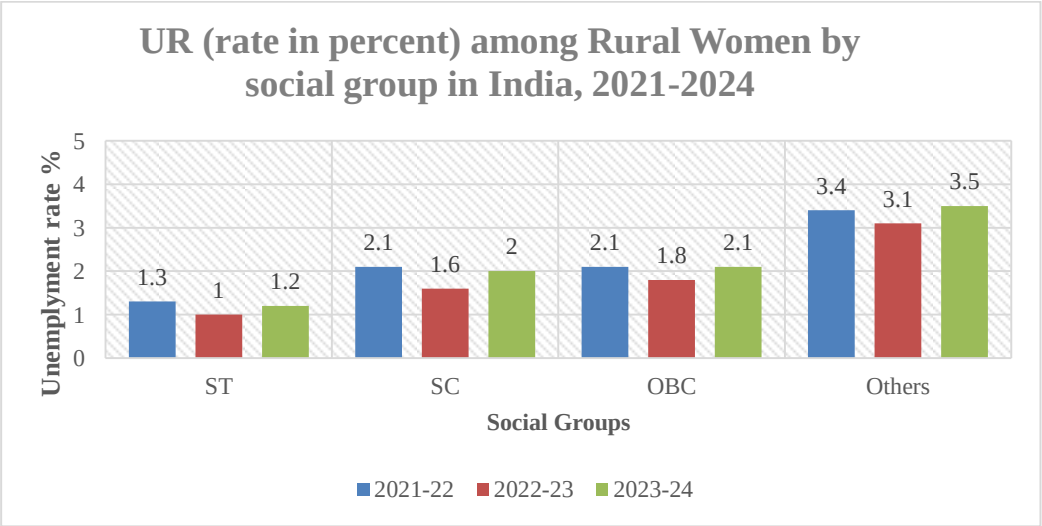

Table No. 3 and Graph No. 3 illustrate the unemployment rates among rural women across various social groups from 2021-22 to 2023-24. Fluctuations in unemployment rates are observed during this period. The unemployment rate among women belonging to Scheduled Tribes was the lowest; it stood at 1.3% in 2021-22 and became 1.2% in 2023-24. For women belonging to Scheduled Castes, the rate shifted from 2.1% to 2.0%. The unemployment rate for OBC women was 2.1% in 2021-22; it declined in 2022-23 but rose again to 2.1% in 2023-24. Women in the 'Other' social group recorded the highest unemployment rate, which was 3.4% in 2021-22 and rose to 3.5% in 2023-24. Likewise, the general trend of unemployment among rural women in 2022-23 dropped but in 2023-24, the unemployment rate rose to 2.1%. On the whole, it is apparent that unemployment rates among rural women have varied over time, and that there are differences in unemployment rates among the various social groups. Women in Scheduled Castes were identified to have the lowest rate of unemployment and those in the Other category had the highest rate of unemployment. The labor force participation rate, labor force participation rate and unemployment rate analysis based on the study showed that there was an increase in employment status of women in rural areas between 2021-22 and 2023-24, although there are disparities in employment status by social group. The situation of women in the Scheduled Tribes with regard to employment has also improved greatly as both LFPR and WPR have increased with a relatively low unemployment rate. In the case of women of Scheduled Castes, the rates of participation (LFPR and WPR) are increasing but still, lower in comparison with other social groups. The women in the category of Others are even worse with regards to their employment status when compared to the Scheduled Caste women; they are still trailing behind with regards to employment in the organized sector. In spite of high LFPR and WPR, these women are only involved in the unorganized sector and in agriculture sector. In general, the data reveals inequalities in employment of rural women in terms of social group and the necessity to provide opportunities to women of Scheduled Castes and the group of the Others in the organised sector and the need to train skills depending on the nature of their working experience.

Conclusion

The present paper finds that although the employment situation of women in rural areas is improved, there are still differences in employment, among social groups. Despite the increasing prevalence of women in the labour force and the workforce, the prevalence levels are still lower among women who are in Scheduled Castes and the Other group; in other words, these women are still lagging behind with regard to the actual labour force and access to employment opportunities. Moreover, the rate of unemployment decreased in 2022-23, but increased in 2023-24. Developing rural women (especially those in Scheduled Castes) can be done through avenues of offering jobs in the formal sector, skills development, education, and training to improve their employability.

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Original Article

Integrating Sustainable Development in Higher Education: Student Engagement and the Role of Academic Libraries in Promoting Sustainable Campus Practices in India

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Abstract

Sustainable development has become a major priority for higher education institutions worldwide. Higher education institutions are not only centres of knowledge creation but also play a crucial role in shaping responsible citizens who can contribute to social, economic, and environmental sustainability. In the Indian context, higher education institutions play an important role in promoting sustainability through student engagement, campus initiatives, and knowledge dissemination. This study adopts a ***qualitative literature review approach*** *to analyse sustainability initiatives in higher education and the role of academic libraries in promoting environmental awareness. The literature examined includes academic publications, sustainability reports, and policy documents published between* ***2015 and 2024****. The study highlights how eco-club activities, sustainability innovation challenges, environmental awareness programs, and campus audits can encourage active student engagement in sustainability initiatives. In addition to teaching, learning and research activities, academic libraries play significant role in facilitating access to sustainability knowledge and supporting environmental literacy among students. Libraries can also promote sustainability education through digital resources, open access environmental databases, environmental information literacy programs, and inclusive learning technologies such as audiobooks for visually impaired students. The paper proposes conceptual frameworks including the* ***Library Sustainability Engagement Model*** *and the* ***Student–Library Sustainability Integration Framework****, which explain how collaboration between students, libraries, and institutions can strengthen sustainability awareness and promote environmentally responsible behaviour. The findings suggest that when sustainability education, student participation, and library initiatives are effectively integrated, institutions can develop environmentally responsible and socially conscious campuses. The paper concludes with recommendations for strengthening sustainability practices through collaborative learning, digital innovation, and student-driven initiatives in Indian higher education institutions.*

Keywords: *sustainable development, higher education, academic libraries, student engagement, green campus, sustainability education*

Introduction

Sustainable development has become a major global concern due to increasing environmental challenges such as climate change, biodiversity loss, resource depletion, and pollution. Addressing these issues requires coordinated efforts from governments, industries, communities, and educational institutions. Higher education institutions play a pivotal role in this process because they educate future leaders, researchers, and professionals who influence policy and societal development Institutions therefore have a responsibility not only to impart knowledge but also to cultivate environmental awareness and sustainable values among students. International initiatives such as the Sustainable Development Goals developed by the United Nations highlight the importance of education in achieving sustainable societies.

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Sustainable Development Goal 4 emphasises the need for quality education that promotes sustainable lifestyles and responsible citizenship. In India, the National Education Policy 2020 encourages interdisciplinary learning, environmental awareness, and experiential education. These reforms provide new opportunities for universities and colleges to integrate sustainability principles into teaching, research, and campus activities. Student participation plays a vital role in sustainability initiatives. Students often contribute innovative ideas and enthusiasm to environmental programs. Active involvement in sustainability activities helps students develop practical knowledge and a stronger sense of environmental responsibility. Academic libraries can also play a significant role in sustainability education by providing access to information resources, supporting environmental research, and organising awareness programs. By integrating student engagement with library initiatives, higher education institutions can develop a sustainable learning environment that promotes both academic excellence and environmental responsibility. Research further indicates that universities serve as key platforms for promoting sustainability knowledge and behavioural change among students and communities. Through education, research, and outreach activities, higher education institutions contribute significantly to addressing environmental challenges and supporting sustainable development efforts.

Objectives of the Study

The study aims to achieve the following objectives:

1. To examine the role of student participation in promoting sustainable development in higher education institutions.
2. To analyse sustainability initiatives implemented by students in universities and colleges.
3. To explore the contribution of academic libraries in promoting sustainability education and environmental awareness.
4. To develop conceptual frameworks integrating library services with student sustainability activities.

Research Gap

Although sustainability has become an important research area in higher education, several gaps remain in the existing literature. Many studies primarily focus on institutional sustainability policies, environmental management systems, and governance mechanisms within institutions. However, limited research examines the role of **student engagement in sustainability initiatives**, particularly in the Indian higher education context. Similarly, the potential contribution of **academic libraries to sustainability education** has not been extensively explored. Libraries are often viewed as traditional information centres, but they have the potential to function as sustainability knowledge hubs that support environmental learning and research. Another significant gap relates to **low-cost sustainability models**. Many international studies discuss sustainability initiatives that require substantial financial investment, which may not be feasible for several Indian colleges and universities.

Therefore, this study addresses these gaps by focusing on student participation, library engagement; digital learning resources are suitable for Indian higher education institutions.

Research Methodology

This study adopts a **qualitative literature review methodology**. Relevant academic articles, policy documents, sustainability reports, and institutional publications related to sustainability in higher education were analysed.

The literature review focused on publications from **2015 to 2024**, ensuring that recent developments and contemporary sustainability practices in higher education were included.

The thematic analysis concentrated on the following areas:

1. Sustainability education in higher education institutions
2. Student engagement in environmental initiatives
3. Sustainability innovation and green campus practices
4. Academic library services for sustainability education
5. Digital and inclusive learning systems

This thematic analysis helped identify strategies through which academic libraries and student activities can collectively promote sustainability within higher education institutions.

Student Activities for Sustainable Development

Student participation plays an important role in creating sustainability awareness within college campuses. Through environmental programs and practical initiatives, students develop a deeper understanding of sustainability challenges and solutions.

Eco-Clubs and Green Campus Programs

Eco-clubs encourage students to organise environmental initiatives such as:

1. Tree plantation drives
2. Campus cleanliness campaigns
3. Biodiversity awareness programs

These activities help students understand environmental issues and develop a sense of responsibility toward nature.

Waste Segregation Campaigns

Students can participate in waste segregation initiatives that promote the separation of biodegradable and non-biodegradable waste. These activities support recycling practices and reduce landfill waste on campus.

Plastic-Free Campus Initiatives

Universities can encourage students to participate in plastic-free campus campaigns. Such initiatives promote the use of reusable materials and discourage single-use plastics in campus cafeterias, events, and hostels.

Use of Public Transportation

Institutes can encourage students to use public transportation such as buses, metro services, or shared

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transport while travelling to the campus. This helps reduce fuel consumption, traffic congestion, and air pollution. Institutions may also motivate students by providing benefits like subsidized passes or incentives for regular use. Such initiatives support environmental conservation and promote a sustainable campus

Energy Conservation Campaigns
Students can organise energy-saving campaigns that encourage responsible electricity use, including switching off lights and electronic devices when not in use. These activities contribute to reducing energy consumption on campus.

Sustainability Innovation Challenges
Universities can organise innovation competitions where students develop solutions for sustainability challenges such as:

1. Waste management
2. Renewable energy
3. Water conservation

Campus Environmental Audits
Students can participate in campus environmental audits to evaluate energy consumption, waste management practices, and water usage.

Community Awareness Programs
Students can also conduct sustainability awareness programs in nearby communities, promoting eco-friendly practices such as waste segregation and water conservation.

Role of Academic Libraries in Sustainability Education
Academic libraries play a crucial role in promoting sustainability knowledge and supporting environmental education.

Sustainability Knowledge Resources
Libraries can develop special collections of books, journals, and digital resources related to environmental studies and sustainability.

Environmental Information Literacy
Libraries can organise training programs to help students locate, evaluate, and use reliable information related to environmental issues.

Digital Learning Initiatives
Promoting e-books, online journals, and digital databases reduces paper consumption and encourages sustainable academic practices.

Open Access Sustainability Resources
Libraries can provide access to open access environmental research repositories and sustainability databases, allowing students and researchers to access scientific literature without financial barriers.

Sustainability Awareness Programs
Libraries can organise exhibitions, seminars, and discussions related to sustainability topics, encouraging students to explore environmental issues through academic research.

Sustainable Digital Library Practices
Academic libraries can adopt innovative digital solutions to promote sustainability while improving accessibility.

Key initiatives include:

1. Online book issue and reservation systems
2. Institutional digital repositories
3. Audiobooks and screen reader support for visually impaired students
4. Digital notice boards instead of printed posters
5. Open reading spaces using natural lighting
6. Reuse of furniture and library materials

Table 1
Sustainable Library Practices

Initiative	Sustainability Benefit	Student Benefit
Online Book Issue System	Reduces paper records	Easy access
E-Books and PDFs	Reduces printing	24/7 access
Audiobooks	Inclusive education	Support for visually impaired students
Digital Notice Boards	Paperless communication	Quick information access
Open Reading Spaces	Reduced electricity use	Comfortable learning environment

Student Sustainability Participation Model
Institutes can introduce creative methods to record and encourage student participation in sustainability activities.

Sustainability Credit Points
Students participating in sustainability initiatives may receive co-curricular credit or institutional recognition.

Green Ambassador Program
Selected students can lead sustainability awareness campaigns and guide other students in eco-friendly practices.

Sustainability Activity Logs
Students can document sustainability activities through digital platforms maintained by academic libraries.

Interpretation and Discussion
The analysis of the literature indicates that sustainability

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initiatives in higher education become more effective when students actively participate in environmental activities. Student engagement increases awareness about environmental issues and encourages responsible behaviour among students. Activities such as eco-club programs, campus environmental audits, sustainability innovation challenges, and community awareness campaigns provide students with practical experience in sustainability practices. Academic libraries also play an important role in supporting sustainability education. By providing access to books, journals, digital resources, and open access environmental databases, libraries help students and researchers obtain reliable information on sustainability issues. Libraries can also organise exhibitions, workshops, and awareness programs to promote environmental knowledge among students. In the Indian context, several universities have started implementing sustainability initiatives on their campuses. **For example, TERI School of Advanced Studies in New Delhi** has developed a green campus model that promotes energy conservation, waste management, and water conservation practices. Students actively participate in environmental research projects, awareness programs, and community outreach activities. Such initiatives show how universities can successfully integrate sustainability education with student participation and campus management practices.

Furthermore, digital initiatives such as online library systems, e-books, digital notice boards, and institutional repositories help reduce paper usage and support sustainable academic practices. These low-cost solutions demonstrate that sustainability initiatives can be implemented effectively even in institutions with limited resources.

Overall, the findings suggest that the combined efforts of student participation, academic library support, and institutional initiatives can help create environmentally responsible and sustainable campuses in higher education institutions.

Way Forward

Higher education institutions should adopt integrated strategies to strengthen sustainability practices.

Institutes should promote interdisciplinary sustainability education and encourage student innovation projects. Academic libraries should expand their role by developing digital sustainability knowledge platforms and supporting student research.

Collaborations with industries, government agencies, and environmental organizations can also strengthen sustainability initiatives within colleges.

Recommendations

1. Integrate sustainability education into academic curricula.
2. Encourage student participation through eco-clubs and sustainability competitions.
3. Strengthen the role of academic libraries in sustainability education.
4. Promote digital learning and paperless academic practices.
5. Develop low-cost sustainable infrastructure in libraries and campuses.

Conclusion

Sustainable development has become an important priority for higher education institutions worldwide. Universities and colleges must prepare students to address environmental challenges and contribute to sustainable societies. Student participation plays a vital role in sustainability initiatives. When supported by academic libraries and institutional policies, student activities can significantly enhance environmental awareness and responsible behaviour. Academic libraries, as centres of knowledge and learning, can act as catalysts for sustainability education by providing access to digital resources, supporting research, and promoting environmental awareness. By integrating sustainability education, student engagement, and library initiatives, higher education institutions can create environmentally responsible campuses and contribute to a sustainable future.

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Original Article

AI-driven Microclimate Prediction and Adaptive Control for Sustainable Agriculture using 3D Printed Smart IoT Sensors for South Solapur Region: A comprehensive Literature Review.

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Abstract:

Precision agriculture has emerged as a transformative approach to improve crop productivity while ensuring sustainability. This study provides an in-depth overview of recent developments in Artificial Intelligence (AI), the Internet of Things (IoT), and 3D printing technologies for microclimate prediction and adaptive control in agriculture. IoT-driven sensor networks facilitate continuous, real-time tracking of environmental factors such as soil moisture, temperature, and humidity, while AI-based models support predictive analysis to enhance decision-making processes. Furthermore, 3D printing facilitates the development of low-cost, customized sensors for agricultural applications. The integration of these technologies supports automated irrigation, nutrient management, and climate-responsive farming practices. This study highlights on current developments, challenges, and research gaps, particularly in the context of semi-arid regions like South Solapur. The study determines that AI-enabled smart agriculture systems hold considerable promise for promoting sustainability, optimizing the use of resources, and increasing overall agricultural productivity.

Keywords: *Microclimate prediction, Precision agriculture, IoT sensors, 3D printing, Machine learning, South Solapur, Adaptive irrigation, Soil health monitoring, Climate-resilient farming, Edge AI*

Introduction

Agriculture remains the backbone of India's economy, employing over 54% of the workforce and contributing nearly 17% to the national GDP. However, agriculture in India—specifically in drought-prone, semi-arid areas like the Solapur district of Maharashtra often faces persistent challenges due to climate-related pressures.Microclimate is defined as the localized atmospheric conditions like temperature, humidity, wind speed, solar radiation and soil moisture within the small geographic area which plays a decisive role in determining crop growth, pest incidence, and irrigation requirements. Traditional one-size-fits-all agricultural management fails to capture this spatial and temporal variability, leading to suboptimal resource allocation and reduced yields.Recent advancements in AI and IoT technologies have enabled the development of smart agricultural systems capable of monitoring, predicting, and controlling environmental conditions. These technologies provide real-time insights into soil health, crop conditions, and weather patterns, allowing farmers to make informed decisions. Additionally, the emergence of 3D printing technology has enabled the development of cost-effective and customized sensors, making smart farming more accessible.This paper reviews the integration of AI, IoT, and 3D printing technologies for microclimate prediction and adaptive control, with a focus on sustainable agriculture in the South Solapur region.

Scope and Objectives of the Review

This review paper addresses the following specific objectives:

- To characterise the agro-climatic profile and agricultural challenges of the South Solapur region as the primary deployment context. To review the state ofAI and machine learning methods for microclimate prediction, soil health assessment, and adaptive agricultural control.
- To examine IoT sensor architectures for field-level environmental and soil monitoring, with emphasis on deployment constraints relevant to South Solapur.
- To evaluate the role of 3D printing in enabling affordable, locally manufacturable sensor enclosures and deployment hardware for harsh field environments.
- To synthesise a conceptual integrated framework combining 3D-printed IoT sensors, edge-deployed AI, and adaptive control for sustainable agriculture in the region.

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To identify research gaps, technical challenges, and future directions for this convergent technology paradigm.

Background and Related Study

Microclimate in Agriculture

Microclimate refers to the localized atmospheric conditions within a specific agricultural area. It includes parameters such as temperature, humidity, soil moisture, and solar radiation. These factors directly influence crop growth, yield, and health.Accurate monitoring and prediction of microclimate conditions are essential for precision agriculture. Variations in microclimate across different parts of a field require site-specific management practices. AI-based models can analyze historical and real-time data to predict microclimate changes and support proactive decision-making.

IoT-Based Smart Agriculture Systems

IoT plays a crucial role in modern agriculture by enabling real-time data collection through sensor networks. Sensors are deployed in fields to monitor parameters such as soil moisture, temperature, humidity, and nutrient levels.

These sensors transmit data to cloud platforms, where it is processed and analyzed. IoT systems support applications such as smart irrigation, crop monitoring, and automated farming operations. Real-time monitoring improves efficiency and reduces resource wastage .

AI Techniques for Microclimate Prediction

AI and machine learning algorithms are widely used for predicting environmental conditions and optimizing agricultural practices. Techniques such as Random Forest, Support Vector Machines (SVM), and Long Short-Term Memory (LSTM) networks are commonly used for climate prediction and crop analysis.

AI models analyze large datasets collected from sensors and weather stations to identify patterns and make accurate predictions. These predictions help farmers plan irrigation, fertilization, and harvesting activities. AI also enables early detection of plant diseases and stress conditions, improving crop yield.

3D Printed Smart IoT Sensors

3D printing technology has introduced a new dimension in agricultural sensor development. It allows the fabrication of low-cost, customized sensors tailored to specific farming needs.

These sensors are lightweight, affordable, and easy to deploy, making them suitable for rural and resource-constrained regions. 3D printed sensors can be used for soil monitoring, environmental

Sensing, and crop health assessment. Their integration with IoT systems enhances data collection efficiency.

Adaptive Control Systems in Agriculture

Adaptive control systems use real-time data and AI predictions to automatically adjust farming operations. These systems enable automated irrigation, fertilizer application, and climate control.

For example, smart irrigation systems use soil moisture data to determine the exact amount of water required, reducing water wastage. AI-driven systems can dynamically adjust agricultural inputs based on changing environmental conditions, improving efficiency and sustainability.

Literature Review

Recent advances in Artificial Intelligence (AI), Internet of Things (IoT), edge computing, and additive manufacturing have significantly transformed precision agriculture by enabling real-time monitoring, predictive analytics, and automated decision-making. The integration of these technologies has improved crop productivity, resource utilization, and climate resilience, particularly in water-stressed agricultural regions.

AI-Based Microclimate Prediction

Artificial Intelligence has emerged as an effective tool for analyzing complex agricultural datasets and predicting environmental variations. Machine learning algorithms such as **Random Forest (RF), Support Vector Machine (SVM), Artificial Neural Networks (ANN), and Long Short-Term Memory (LSTM)** have demonstrated high prediction accuracy for temperature, humidity, soil moisture, crop yield, and disease detection. Among these, LSTM models have shown superior performance in modeling temporal variations of microclimatic parameters due to their ability to capture long-term dependencies in time-series data. Recent studies have also explored hybrid deep learning models combining CNN and LSTM for crop monitoring using satellite and UAV imagery, improving prediction accuracy and early stress detection. However, most existing models are developed using generalized datasets and lack regional calibration for semi-arid agricultural environments such as South Solapur.

IoT-Based Smart Agriculture Systems

IoT-enabled wireless sensor networks form the backbone of modern precision agriculture by continuously monitoring environmental and soil conditions. Sensors measuring soil moisture, temperature, humidity, solar radiation, and nutrient levels transmit real-time information to cloud or edge platforms for analysis. Communication technologies including **LoRaWAN, ZigBee, NB-IoT, and Wi-Fi** have been widely adopted depending on coverage, power consumption, and deployment requirements. Among these, LoRaWAN has gained considerable attention because of its long communication range and low energy consumption, making it particularly suitable for rural agricultural applications. Although IoT systems significantly improve irrigation scheduling and farm management, many existing deployments focus primarily on data acquisition and monitoring without incorporating intelligent predictive control mechanisms.

3D-Printed Smart IoT Sensors

Recent developments in additive manufacturing have enabled the fabrication of low-cost and customized agricultural sensing devices. **3D printing** facilitates rapid prototyping of sensor enclosures, protective housings, and environmental monitoring units using materials such as PLA, PETG, and ASA. Compared with conventional commercial enclosures, 3D-printed components substantially reduce manufacturing costs while allowing customization for specific field conditions. Researchers have also demonstrated the feasibility of developing low-cost soil moisture and environmental sensing devices through additive manufacturing. Despite these advantages, the adoption of 3D-printed sensors in Indian agriculture remains limited, and long-term durability under harsh environmental conditions requires further investigation.

Adaptive Control and Edge Intelligence

The integration of AI predictions with automated irrigation systems has led to the development of adaptive agricultural control systems capable of optimizing water and nutrient management. Conventional controllers based on PID and fuzzy logic have been widely employed for irrigation automation, whereas **Model Predictive Control (MPC)** and **Reinforcement Learning (RL)** are emerging as advanced solutions capable of optimizing resource utilization under dynamic environmental conditions. Simultaneously, **edge computing** enables real-time processing of sensor data near the field, reducing communication latency and dependence on cloud connectivity. Lightweight AI models deployed on embedded platforms such as ESP32 and Raspberry Pi support rapid decision-making even in remote farming locations with limited internet access. Nevertheless, integrated

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implementations combining edge AI, IoT sensing, predictive analytics, and adaptive control remain scarce, particularly for region-specific agricultural applications.

Research Summary

The reviewed literature demonstrates that AI, IoT, and additive manufacturing individually contribute to precision agriculture through intelligent prediction, real-time monitoring, and affordable sensing technologies. However, most existing studies address these components independently, with limited emphasis on integrated architectures that combine sensing, prediction, decision-making, and adaptive control. Furthermore, very few studies consider region-specific environmental characteristics or develop cost-effective solutions suitable for smallholder farmers in semi-arid regions. These limitations motivate the development of a unified AI-IoT framework employing 3D-printed smart sensors and adaptive microclimate prediction for sustainable agriculture in South Solapur.

Comparative Literature Summary

Table 1 presents a structured review of 15 key representative works identified across the four thematic domains covered in this review, evaluated on topic, key contributions, and limitations.

Table 1: Summary of Key Literature Reviewed

Ref No.	Authors & Year	Topic / System	Key Findings	Limitations
[1]	Liakos et al. (2018)	ML in Precision Agriculture	SVM and ANN models achieve >90% accuracy for crop disease detection	High computational cost; limited field validation
[2]	Tzounis et al. (2017)	IoT in Agriculture – Review	Comprehensive survey of WSN-based farm monitoring systems	Lacks real-time adaptive control loop
[3]	Navarro et al. (2020)	Smart Irrigation Using IoT	Soil moisture-based irrigation reduces water use by 30%	No microclimate prediction model included
[4]	Wolfert et al. (2017)	Big Data in Smart Farming	Integration of data analytics improves yield prediction by 15–20%	Data privacy and interoperability challenges
[5]	Suma et al. (2017)	Smart Agriculture using IoT & Cloud	Automated alerts improve response time to crop stress events	Sensor calibration drift not addressed
[6]	Cambra et al. (2019)	LoRaWAN based Sensor Network	Long-range IoT network with 5 km coverage in rural areas	Energy harvesting not considered
[7]	Khanna & Kaur(2019)	IoT-based Precision Farming	Real-time monitoring reduces input costs by 18%	Not validated for semi-arid conditions
[8]	Farooq et al. (2019)	IoT in Agriculture – Challenges	Identifies security, scalability, and power constraints as main issues	No proposed solutions or prototypes
[9]	Codeluppi et al. (2020)	3D-Printed IoT Enclosures	Custom-printed enclosures reduce deployment cost by 40%	Limited IP-rating validation
[10]	Sharma et al. (2020)	Microclimate Monitoring – India	Temperature-humidity variations affect yield by up to 22%	No automated control system integrated
[11]	Talaviya et al. (2020)	AI-based Irrigation Management	DNN model improves irrigation scheduling efficiency by 25%	Not tested in Maharashtra agro-climate
[12]	Sagan et al. (2021)	UAV-IoT Integration for Crop Stress	Combined system detects drought stress 5 days earlier than manual inspection	High cost of UAV infrastructure
[13]	Chlingarya n et al. (2018)	ML for Yield Prediction	Random Forest out performs regression models for wheat yield prediction	Requires large historical datasets
[14]	Gondchaw ar&Kawitkar (2016)	IoT in Smart Agriculture	Automated drip/sprinkler control using sensor fusion	Protocol interoperability issues noted
[15]	Verdouw et al. (2021)	Digital Twins in Agriculture	Real-time crop simulation with >88% accuracy in greenhouse scenarios	Scalability to open field not demonstrated

Identified Research Gaps

Based on the systematic literature review conducted across 50+ works spanning 2015–2024, the following critical research gaps are identified:

Absence of Region-Specific Microclimate Models for South Solapur

Most existing prediction models are trained using datasets collected from different climatic regions and therefore cannot accurately represent the unique environmental conditions of South Solapur. Developing localized AI models using regional microclimate data remains an important research challenge.

High Cost of Smart Farming Infrastructure

Commercial agricultural monitoring systems are often expensive for small and medium-scale farmers. Although additive manufacturing has demonstrated considerable potential for producing economical sensor enclosures and customized devices, its application in Indian precision agriculture remains limited.

Limited Integration of AI, IoT, and Adaptive Control

Most published studies implement environmental monitoring or predictive analytics independently. Few systems integrate real-time sensing, AI-based prediction, automated irrigation, and continuous feedback within a unified closed-loop architecture capable of autonomous agricultural decision-making.

Insufficient Edge Intelligence

Cloud-based processing introduces latency and depends on reliable internet connectivity, which is often unavailable in rural farming regions. Lightweight AI

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models deployed on edge devices remain insufficiently explored for real-time agricultural applications.

Limited Regional Validation

Many proposed smart agriculture solutions have been evaluated only under laboratory or controlled experimental conditions. Comprehensive field validation under semi-arid environments such as South Solapur is still lacking, limiting their practical adoption.

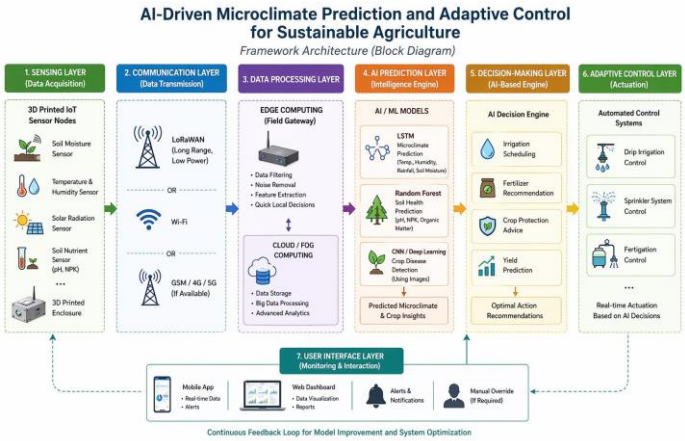
Proposed Research Framework

Overview of the Framework

This study proposes an integrated AI-IoT-based research framework for microclimate prediction and adaptive agricultural control, specifically designed for semi-arid regions such as South Solapur. The framework combines 3D printed smart sensors, IoT communication, edge/cloud AI models, and automated control systems to enable real-time, data-driven farming decisions.

The framework follows a closed-loop architecture, where environmental data is continuously sensed, analyzed, predicted, and used to control agricultural operations dynamically.

Framework Architecture:



Data Acquisition Layer (Sensing Layer)

1. 3D printed IoT sensor nodes deployed across farm
2. Sensors measure:
3. Soil moisture
4. Temperature & humidity
5. Soil nutrients
6. Solar radiation
7. Low-cost, customized sensor housings using 3D printing

Communication Layer

1. Data transmission using:
2. LoRaWAN (long-range rural communication)
3. Wi-Fi / GSM (if available)
4. Energy-efficient protocols for continuous monitoring

Data Processing Layer

Edge Computing (on-field devices):

Real-time filtering and preprocessing

Noise reduction

Cloud/Fog Computing:

Data storage

Large-scale analytics

AI Prediction Layer

1. Machine Learning / Deep Learning models:
2. LSTM → Microclimate prediction
3. Random Forest → Soil health classification
4. CNN → Crop disease detection
5. Output:
6. Future temperature, humidity, soil moisture
7. Crop stress prediction

Decision-Making Layer

1. AI-based decision engine:
2. Determines irrigation schedule
3. Fertilizer requirement
4. Pest control actions

Adaptive Control Layer (Actuation)

1. Automated systems:
2. Smart irrigation (drip/sprinkler ON/OFF)
3. Fertigation systems
4. Feedback loop adjusts actions based on predictions

User Interface Layer

1. Mobile/web dashboard for farmers:
2. Real-time monitoring
3. Alerts & recommendations
4. Manual override option

Working Mechanism (Step-wise Flow)

1. Sensors collect real-time environmental data
2. Data transmitted via IoT network
3. Preprocessing at edge devices
4. AI models predict microclimate conditions
5. Decision system generates control actions
6. Irrigation/fertilization automatically adjusted
7. Feedback improves system accuracy over time

Key Features of Proposed Framework

1. Low-cost implementation using 3D printed sensors
2. Region-specific design for South Solapur
3. Real-time microclimate prediction
4. Closed-loop adaptive control system
5. Scalable and energy-efficient architecture
6. Edge AI support for low connectivity areas

Stepwise Flow of proposed framework Step 1: Deployment of Low-Cost Sensor Nodes

1. 3D-printed IoT sensor units are deployed across different locations in the farm.
2. Sensors continuously measure parameters such as soil moisture, temperature, humidity, and solar radiation.
3. The use of 3D printing reduces cost and allows customization for local conditions.

Step 2: Real-Time Data Acquisition

1. Environmental data is collected continuously from all sensor nodes.
2. Data is captured at regular intervals to reflect real-time microclimate conditions.

Step 3: Energy-Efficient Data Transmission

1. The collected data is transmitted using communication technologies such as LoRaWAN or Wi-Fi.
2. Low-power communication ensures long-term operation in rural environments.

Step 4: Edge-Level Data Processing

- Initial data preprocessing (filtering, noise removal) is performed at edge devices.
- This reduces data redundancy and improves processing efficiency.

Step 5: AI-Based Microclimate Prediction

1. Machine learning models (e.g., LSTM, Random Forest) analyze processed data.
2. The system predicts future environmental conditions such as:
3. Soil moisture levels
4. Temperature variations
5. Humidity changes

Step 6: Intelligent Decision-Making

1. Based on predictions, the AI decision engine determines optimal actions such as:
2. Irrigation scheduling
3. Fertilizer application
4. Crop protection measures

Step 7: Adaptive Control Execution

1. Automated systems (e.g., drip irrigation, sprinklers) are activated accordingly.
2. Actions are dynamically adjusted based on real-time conditions.

Step 8: Continuous Feedback Mechanism

1. The system continuously monitors outcomes of actions taken.
2. Feedback is used to refine predictions and improve system accuracy over time.

Step 9: User Interaction and Monitoring

1. Farmers can monitor data via mobile/web dashboards.
2. Alerts and recommendations are provided.
3. Manual override option is available if required.

Novelty of the Framework

1. This framework addresses key gaps identified in literature by:
2. Integrating **AI + IoT + 3D printing (rare combination)**
3. Providing **region-specific microclimate modeling**
4. Enabling **predictive + adaptive control (closed loop)**
5. Supporting **low-cost deployment for small farmers**

Conclusion

This review paper has comprehensively examined the integration of Artificial Intelligence (AI), the Internet of Things (IoT), and 3D printing technologies for microclimate prediction and adaptive control in sustainable agriculture. The study highlights that precision agriculture, supported by real-time data acquisition and intelligent analytics, plays a crucial role in addressing key challenges such as climate variability, water scarcity, and inefficient resource utilization.The analysis of existing literature demonstrates that IoT-based sensor networks enable continuous monitoring of environmental and soil parameters, while AI models provide accurate predictions and decision support for optimizing agricultural operations. Additionally, 3D printing technology offers a promising solution for developing low-cost, customizable sensor systems, making smart agriculture more accessible, particularly in resource-constrained regions.Despite significant advancements, several challenges remain, including high implementation costs, limited technical expertise, data management issues, and inadequate region-specific models. In particular, the lack of integrated systems that combine microclimate prediction with adaptive control mechanisms highlights an important research gap.The proposed framework addresses these limitations by presenting a unified, cost-effective, and scalable approach that integrates 3D printed IoT sensors, edge/cloud-based AI models, and automated control systems. This integrated approach is especially relevant for semi-arid regions such as South Solapur, where efficient resource management is critical for sustainable farming.In conclusion, the convergence of AI, IoT, and additive manufacturing technologies has the potential to transform traditional agriculture into a smart, data-driven, and sustainable system. Future research should focus on developing region-specific predictive models, enhancing edge computing capabilities, improving sensor durability, and promoting large-scale adoption through policy support and farmer training. Such advancements will play a vital role in achieving climate-resilient and resource-efficient agriculture.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper

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Original Article

Cross-Cultural Communication of Bodo and Assamese: A Critical Study

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Abstract
Cross-cultural communication refers to the process of interaction, exchange, interpretation, and negotiation of meanings among individuals and communities belonging to different cultural and linguistic backgrounds. In a culturally plural region like Assam, communication among diverse ethnic communities has played a fundamental role in the development of social relations and regional cultural identity. Among the indigenous and linguistic communities of Assam, the Bodo and Assamese communities have maintained a long history of geographical proximity, socio-economic interaction, linguistic contact, and cultural exchange. The present paper critically studies the nature, forms, and significance of cross-cultural communication between Bodo and Assamese communities. Assamese culture has evolved as a composite cultural formation through the interaction of Indo-Aryan, Tibeto-Burman, Tai, and other indigenous cultural traditions. Bodo culture, belonging to a major Tibeto-Burman linguistic community, possesses a distinctive cultural identity rooted in agricultural life, nature-oriented beliefs, Bathou religious traditions, Bwisagu, oral literature, folk music, dance, weaving, and community-based social practices. Despite their distinctive cultural identities, Bodo and Assamese communities have communicated continuously through language, agriculture, trade, festivals, folklore, food habits, dress, music, religion, education, literature, and everyday social relationships. The present study follows descriptive, comparative, and analytical methods and is primarily based on secondary sources. The study argues that Bodo-Assamese cultural communication cannot be interpreted merely as a unilateral process of assimilation. Rather, it is a multidirectional and dialogic process involving cultural borrowing, adaptation, negotiation, resistance, and reinterpretation. Bilingualism and code-switching have become important instruments of inter-community communication, while festivals, music, dance, weaving, and food practices function as significant non-verbal cultural media. Translation and educational institutions have further created new spaces of cultural understanding. Nevertheless, linguistic hierarchy, stereotyping, political conflicts, identity anxieties, and unequal cultural representation sometimes create barriers to effective communication. The study concludes that mutual cultural respect, bilingual and multilingual education, translation, comparative cultural studies, responsible media representation, and equal recognition of indigenous traditions are essential for strengthening Bodo-Assamese relations. Cross-cultural communication based on cultural equality can contribute significantly to social harmony, regional solidarity, and the development of an inclusive multicultural society in Assam.

Keywords: *Cross-cultural communication, Bodo culture, Assamese culture, bilingualism, cultural exchange, identity, Assam, intercultural dialogue.*

Introduction

Culture is one of the fundamental dimensions of human social existence. It includes values, beliefs, customs, language, symbols, rituals, knowledge, artistic expressions, and patterns of social behaviour transmitted from one generation to another. Communication is the principal process through which cultural knowledge is expressed, shared, interpreted, and reconstructed. Hall (1976) considers culture and communication inseparable because human communication always takes place within a system of culturally constructed meanings. Cross-cultural communication, therefore, refers to interaction among persons or communities whose cultural backgrounds, languages, beliefs, and social experiences are different. The concept of cross-cultural communication has acquired particular importance in multicultural societies. According to Samovar et al. (2017), communication between cultures involves the interpretation of verbal and non-verbal messages within different cultural frameworks. Cultural difference may enrich communication, but differences in language, social values, and symbolic practices may also create misunderstanding. Effective cross-cultural communication consequently requires cultural awareness, respect, and an ability to interpret the worldview of another community. Assam is one of the most culturally and linguistically diverse regions of India. Its geographical location has historically facilitated migration, settlement, interaction, and cultural exchange among different human groups. The social and cultural history of Assam demonstrates the presence and interaction of Indo-Aryan,

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Tibeto-Burman, Tai, and Austroasiatic cultural streams. Barua (1951) observes that Assamese culture emerged through a prolonged historical process involving diverse communities. Therefore, the cultural identity of Assam cannot be understood through the experience of a single ethnic group. The Bodos constitute one of the major indigenous communities of Assam. Linguistically, Bodo belongs to the Bodo-Garo group of the Tibeto-Burman branch of the Sino-Tibetan language family. Chatterji (1951) discussed the historical significance of the Bodo and other Tibeto-Burman peoples in the cultural development of eastern and north-eastern India. The Bodos possess a rich cultural tradition expressed through language, Bathou religious practices, oral narratives, Bwisagu, Bagurumba, music, weaving, food culture, and agricultural customs. The Assamese-speaking community has also developed within a culturally heterogeneous social environment. The Assamese language belongs to the Indo-Aryan language family, but its historical development occurred in continuous contact with various non-Indo-Aryan languages. Kakati (1962) recognised the importance of non-Aryan influences in the formation and development of Assamese. Such linguistic interaction is an important example of long-term cross-cultural communication. The Bodo and Assamese communities have lived in geographical proximity for centuries. Their communication has taken place in agricultural fields, markets, villages, religious and cultural institutions, schools, colleges, administrative centres, and public spaces. Language contact, bilingualism, shared ecological experience, participation in cultural programmes, and literary translation have created various forms of cultural communication. However, the relationship is complex. Cross-cultural communication does not necessarily imply complete cultural agreement. Political movements, linguistic questions, ethnic identity, territorial aspirations, and unequal cultural representation have occasionally created tensions between Bodo and Assamese communities. A critical study must therefore examine both cultural convergence and cultural difference. The present paper studies Bodo-Assamese cross-cultural communication as a dynamic process of cultural contact, exchange, adaptation, negotiation, and identity preservation. It attempts to understand how two culturally distinctive communities communicate within the plural socio-cultural space of Assam.

Scope of the Study

The present study is primarily concerned with the cultural and communicative relationship between the Bodo and Assamese communities of Assam. Its scope includes linguistic interaction, bilingualism, festivals, agriculture, folk culture, music, dance, weaving, traditional dress, food habits, religious practices, folklore, literature, education, and contemporary media. The study focuses on cultural communication rather than providing a detailed political history of Bodo-Assamese relations. Political and identity-related issues are discussed only to the extent that they influence intercultural communication. The geographical scope is mainly Assam, particularly the social context in which Bodo and Assamese speakers have experienced regular contact. The paper also examines cross-cultural communication from a critical perspective. It considers cultural exchange, assimilation, cultural resistance, linguistic hierarchy, stereotyping, and the question of equal cultural representation. Thus, the study attempts to understand both the positive dimensions and challenges of Bodo-Assamese cultural communication.

Objectives of the Study

The major objectives of the study are:

1. To examine the basic characteristics of Assamese and Bodo cultures.
2. To study the historical background of cultural interaction between Bodo and Assamese communities.
3. To identify the major forms of cross-cultural communication between the two communities.
4. To analyse linguistic and bilingual communication between Bodo and Assamese speakers.
5. To examine the role of festivals, agriculture, music, dance, food, dress, folklore, and religion in cultural communication.
6. To study the importance of literature, translation, education, and media in Bodo-Assamese cultural interaction.
7. To critically analyse the challenges of linguistic hierarchy, cultural stereotyping, and unequal representation.
8. To evaluate the significance of cross-cultural communication in promoting social harmony and multicultural understanding in Assam.

Methodology

The present study adopts descriptive, analytical, and comparative research methods. The descriptive method is used to present the major features of Assamese and Bodo cultures. The comparative method is employed to identify cultural similarities, differences, and areas of interaction. The analytical method is applied to interpret cultural borrowing, linguistic contact, identity negotiation, and the challenges of cross-cultural communication. The study is qualitative in nature and is mainly based on secondary data. Books on Assamese and Bodo culture, linguistic studies, ethnographic writings, historical works, cultural studies, and communication theories have been consulted. The theoretical ideas of Edward T. Hall and Samovar et al. have been used to understand the broader nature of cross-cultural communication.

Historical and colonial ethnographic sources, particularly Endle's *The Kacharis*, have been critically used. Colonial ethnography often represented indigenous communities through external administrative categories. Therefore, information from such sources requires comparison with later Bodo cultural scholarship and regional cultural studies.

Significance of the Study

The present study is significant because Bodo-Assamese relations have often been discussed primarily within political, linguistic, and ethnic frameworks. Although these dimensions are important, everyday cultural communication between the two communities requires greater academic attention. The study contributes to comparative cultural studies, Bodo studies, Assamese studies, communication studies, folklore, and indigenous studies. It emphasises that cultural contact is not merely an abstract historical process. It operates through language choice, food exchange, dress, music, festivals, educational institutions, and everyday human relationships. The study is also important for multicultural education. Knowledge of neighbouring cultures can reduce prejudice and cultural stereotyping. According to Samovar et al. (2017), cultural awareness is essential for successful intercultural communication. In the context of Assam, knowledge of Bodo history and culture among Assamese speakers and knowledge of Assamese cultural traditions among Bodo speakers can promote mutual understanding. The study further highlights the need for translation, bilingual education, comparative literature, and equal cultural representation. It may provide a framework for future research on intercultural relations among the various communities of Northeast India.

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Discussion

Culture is neither static nor completely isolated. Human communities communicate continuously with neighbouring societies and exchange material and non-material cultural elements. Cultural contact may result in borrowing, adaptation, reinterpretation, hybrid cultural forms, or resistance. Burke (2009) describes cultural hybridity as an important consequence of prolonged cultural encounters. Cross-cultural communication must not be understood only as verbal conversation. Music, dance, dress, food, rituals, gestures, and material objects can also communicate cultural meanings. Hall (1976) emphasises the significance of context and non-verbal symbols in cultural communication. In Bodo-Assamese interaction, verbal and non-verbal communication are equally important. The common geographical environment of Assam has provided the basic context for Bodo-Assamese interaction. The Brahmaputra Valley, its rivers, forests, agricultural land, and monsoon climate have shaped the cultural experiences of both communities. Shared ecological conditions have produced comparable cultural responses, particularly in agricultural festivals and food practices.

At the same time, each community has developed its own language, symbols, religious beliefs, and cultural institutions. Therefore, Bodo-Assamese communication represents an interaction between cultural similarity and cultural difference.

Cross-Cultural Communication of Bodo and Assamese

Cross-cultural communication between Bodo and Assamese communities is the result of prolonged geographical and social contact. Both communities have inhabited the wider Brahmaputra Valley and adjoining regions. Agriculture, trade, administration, education, and common public spaces have created continuous opportunities for interaction.

Language as a Medium of Cross-Cultural Communication

Language is perhaps the most important medium of Bodo-Assamese communication. Assamese historically developed as a major language of wider communication in Assam. Many Bodo speakers acquired Assamese for communication with neighbouring communities, trade, administration, and education. Bilingualism consequently became a common communicative practice in areas of Bodo-Assamese contact. A Bodo speaker may use Bodo in family and community contexts and Assamese in wider inter-community situations. The choice of language is influenced by participants, place, purpose, and social context. Code-switching also occurs in everyday communication. Speakers may move between Bodo and Assamese within a social interaction. Such linguistic flexibility is not necessarily evidence of linguistic weakness. It may represent communicative competence in a multilingual society. The linguistic relationship is not entirely one-sided. Assamese itself developed through contact with non-Indo-Aryan languages. Kakati (1962) recognised the influence of Bodo and other non-Aryan linguistic elements on Assamese. Cultural and linguistic communication is therefore historical and reciprocal. However, bilingualism also raises questions of linguistic power. When one language dominates education, administration, or public communication, speakers of another language may experience pressure to shift linguistically. Cross-cultural communication should therefore encourage multilingualism rather than language replacement.

Bwisagu and Bihu as Cultural Communication

Bwisagu and Bohag Bihu provide important examples of cultural proximity. Both festivals are associated with spring, agricultural life, youth, music, dance, and renewal. Their seasonal contexts create comparable cultural meanings.

Nevertheless, Bwisagu and Bihu should not be considered identical. Bwisagu possesses distinctive Bodo songs, musical instruments, ritual practices, and cultural memories. Bihu similarly has its own Assamese historical and cultural forms. Critical cross-cultural understanding requires recognition of both similarity and difference. Contemporary cultural programmes have brought Bwisagu, Bagurumba, Bihu songs, and Bihu dance into common public spaces. Audiences from different communities observe and appreciate these performances. Performance becomes a form of non-verbal cultural communication.

Agricultural and Ecological Communication

Traditional Bodo and Assamese societies are closely associated with agriculture. Rice cultivation creates shared experiences of seasonal labour, monsoon, harvest, and community cooperation. Agricultural knowledge is communicated through observation, participation, and inter-community contact.

The natural environment also influences folklore, songs, and rituals. Rivers, birds, flowers, forests, and seasonal changes appear in Bodo and Assamese cultural expressions. Shared ecology creates a cultural vocabulary through which communities can understand each other's experiences.

Music and Dance

Music and dance communicate cultural meanings beyond linguistic boundaries. A person who does not understand the Bodo language may still respond to the rhythm and movements of Bagurumba. Similarly, Bihu dance communicates energy, youthfulness, and celebration to non-Assamese audiences. The Bodo *sifung* and *kham* and Assamese *pepa* and *dhol* are important identity symbols. When these musical traditions are presented in multicultural festivals, they communicate the cultural diversity of Assam. Cultural exchange, however, should avoid reducing indigenous traditions to entertainment. Bagurumba must be understood within Bodo cultural history and not merely as a colourful stage performance. Meaningful communication requires contextual knowledge.

Weaving, Dress, and Cultural Symbols

Both Bodo and Assamese communities possess rich weaving traditions. Women have played a significant role in preserving textile knowledge. The Bodo *dokhona* and *aronai* and Assamese *mekhela-chador* and *gamosa* function as visible markers of identity. The presentation of an *aronai* or *gamosa* to a guest communicates honour and respect. In inter-community programmes, the exchange of such cultural objects creates symbolic communication. Cultural symbols become instruments of friendship. Modern fashion has also encouraged interaction among textile traditions. Motifs and designs circulate through markets and cultural events. Nevertheless, traditional designs should be used with cultural sensitivity and recognition of their community origins.

Food as Cultural Communication

Food provides an informal but effective medium of cross-cultural communication. Both communities share rice-based food traditions and use locally available vegetables, fish, meat, herbs, and fermented products. Bodo dishes such as *onla*, *narzi*, and *napham* have increasingly become known beyond the Bodo community. Assamese *khar*, *tenga*, *pitha*, and other foods are also consumed across community boundaries. Markets, inter-community friendships,

educational institutions, and urban life facilitate culinary exchange. Through food, people experience another culture directly. Food communication can challenge stereotypes and create cultural curiosity.

Religious and Philosophical Interaction

Religious interaction between Bodo and Assamese communities is historically complex. Bathou represents an indigenous Bodo religious worldview deeply associated with nature and community traditions. Assamese religious culture has been significantly influenced by Hinduism and Neo-Vaishnavism. Historical contact resulted in various forms of religious and cultural influence among Bodo populations. Brahma (1992) indicates the complex development of Bodo socio-religious beliefs. Such interaction demonstrates that religious cultures may change through contact while indigenous traditions continue to survive. The Neo-Vaishnavite movement created a broader cultural environment through literature, music, and community institutions (Neog, 1980). However, cultural integration must not be interpreted as the disappearance of indigenous religious identity. Cross-cultural communication becomes democratic only when Bathou and other indigenous traditions receive respectful recognition.

Folklore and Oral Traditions

Folklore travels easily across cultural boundaries. Folk tales, legends, proverbs, and songs may contain comparable themes because neighbouring communities share geographical and historical experiences. Datta (2012) emphasises the importance of studying the folklore of Northeast India through the concepts of contact and cultural commonality. Comparative study of Bodo and Assamese folklore can reveal common motifs relating to animals, rivers, agriculture, supernatural beings, and social morality. Folklore is therefore a cultural archive of intercultural contact. Comparative folklore studies can contribute significantly to Bodo-Assamese understanding.

Literature and Translation

Literature is an important instrument of cross-cultural communication. Modern Bodo literature expresses Bodo history, social change, cultural identity, and contemporary experience. Assamese literature similarly reflects the diverse experiences of Assam. Translation creates a bridge between literary cultures. A Bodo literary work translated into Assamese enables Assamese readers to encounter Bodo social and cultural experiences. Assamese literature translated into Bodo performs a similar function. Translation should be encouraged at institutional and academic levels. Comparative studies of Bodo and Assamese poetry, fiction, drama, and folklore can create deeper cultural dialogue. Translation is not merely the substitution of words; it involves the interpretation of cultural meanings.

Education and Media

Educational institutions are important contemporary spaces of cross-cultural communication. Bodo and Assamese students interact in schools, colleges, and universities. Cultural programmes, seminars, workshops, and literary meetings create opportunities for intercultural learning. Departments of Bodo and Assamese can jointly organise translation workshops, comparative literary seminars, folklore documentation projects, and cultural exchange programmes. Such academic cooperation can transform informal cultural contact into systematic cultural understanding. Print, television, cinema, and digital media have also expanded cultural communication. Social media platforms circulate Bodo and Assamese songs, dances, poems, and cultural discussions among multilingual audiences. Digital communication has created new possibilities for cultural visibility. At the same time, irresponsible social media communication may promote stereotypes and ethnic hostility. Cultural communication in digital spaces requires ethical responsibility and cultural sensitivity.

Challenges of Bodo-Assamese Cross-Cultural Communication

One major challenge is linguistic hierarchy. When a dominant regional language receives greater institutional support, smaller linguistic communities may fear language loss. Effective cross-cultural communication must recognise the equal dignity of Bodo and Assamese languages. A second challenge is cultural stereotyping. Bodo culture is sometimes represented only through Bagurumba, traditional dress, and festivals. Such representation ignores Bodo literature, philosophy, religious thought, intellectual history, and contemporary social experience. A third challenge is the politicisation of identity. Political conflicts and territorial questions may influence cultural relationships. Cultural differences may be transformed into symbols of political opposition. A fourth problem is unequal representation in regional cultural narratives. Assamese culture is sometimes represented as homogeneous. Barua (1951) and Datta (2012), however, indicate the historically composite nature of the cultural region. Recognition of indigenous contributions strengthens rather than weakens the plural identity of Assam. Cross-cultural communication should therefore be dialogic. Both communities must possess opportunities to speak, interpret, and represent themselves. Cultural integration should not mean forced assimilation. As Hall (1976) suggests, cultural understanding requires awareness of different systems of meaning. Translation, multilingual education, comparative research, and joint cultural programmes can strengthen communication. Respect for cultural difference must remain the ethical foundation of such interaction.

Conclusion

The present study has critically examined cross-cultural communication between Bodo and Assamese communities. The history and culture of Assam reveal prolonged interaction among diverse linguistic and ethnic groups. Assamese culture is a composite cultural formation, while Bodo culture possesses a distinctive indigenous identity rooted in language, agriculture, nature, Bathou traditions, Bwisagu, oral literature, music, dance, weaving, and food practices. Bodo-Assamese communication operates through multiple channels. Language and bilingualism constitute important verbal media. Festivals, music, dance, weaving, dress, food, and rituals function as powerful non-verbal media. Literature, translation, education, and digital communication have created new spaces of interaction. The study demonstrates that cross-cultural communication is not identical with assimilation. Cultural contact is multidirectional. Communities borrow, reinterpret, accept, and sometimes resist cultural elements. Therefore, the relationship between Bodo and Assamese cultures should be interpreted as a continuous process of cultural negotiation. Bwisagu and Bihu demonstrate how shared agricultural and ecological experiences may produce cultural proximity while maintaining distinctive traditions. Similarly, weaving, food culture, and folk music reveal areas of mutual cultural understanding. Nevertheless, linguistic hierarchy, stereotyping, political tensions, and unequal representation remain barriers. Indigenous culture should not be reduced to colourful performance. Bodo literature, philosophy, religious traditions, and intellectual contributions deserve wider recognition.

The future of Bodo-Assamese cross-cultural communication depends on equality and mutual respect. Bilingual education, translation, comparative cultural studies, responsible media representation, and collaborative academic programmes can contribute to intercultural understanding. In conclusion, Bodo and Assamese cultures are distinctive but historically interconnected. Their communication represents an important dimension of Assam's multicultural society. Cultural unity should not demand the destruction of difference. Rather, an inclusive society must recognise diversity as a source of collective cultural strength. Democratic and dialogic cross-cultural communication can contribute to peace, social harmony, and the inclusive cultural development of Assam.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Findings

1. Assamese culture is a composite cultural formation shaped by prolonged interaction among diverse ethnic and linguistic communities.
2. Bodo culture possesses a distinctive indigenous identity rooted in language, agriculture, nature, and community traditions.
3. Geographical proximity has facilitated continuous Bodo-Assamese cultural communication.
4. Bilingualism is one of the major instruments of communication between Bodo and Assamese speakers.
5. Code-switching reflects communicative flexibility in multilingual social situations.
6. Bwisagu and Bohag Bihu share agricultural and seasonal contexts but preserve distinctive cultural identities.
7. Music and dance function as significant forms of non-verbal cross-cultural communication.
8. Bagurumba and Bihu have created wider public spaces for mutual cultural appreciation.
9. Traditional weaving is an important area of cultural similarity and identity preservation.
10. The *aronai* and *gamosa* function as cultural symbols of respect and social communication.
11. Food practices create informal opportunities for cultural exchange.
12. Shared ecological experiences influence the folklore and cultural imagination of both communities.
13. Bathou traditions represent an important indigenous dimension of Bodo cultural identity.
14. Religious contact has produced cultural interaction without completely eliminating indigenous traditions.
15. Folklore provides important evidence of cultural contact and common regional motifs.
16. Translation is an effective instrument of Bodo-Assamese literary communication.
17. Educational institutions can play a major role in promoting comparative cultural understanding.
18. Digital media has expanded the circulation of Bodo and Assamese cultural expressions.
19. Linguistic hierarchy may negatively affect equal cross-cultural communication.
20. Cultural stereotyping creates an incomplete understanding of Bodo cultural life.
21. Political and identity conflicts sometimes create barriers to intercultural dialogue.
22. Cross-cultural communication between Bodo and Assamese communities is multidirectional rather than unilateral.
23. Cultural integration should not be confused with cultural assimilation.
24. Equal representation of indigenous cultures is necessary for democratic cultural communication.
25. Translation, multilingual education, and comparative research can strengthen Bodo-Assamese relations.
26. Mutual cultural respect is essential for maintaining social harmony in Assam.
27. Bodo-Assamese cross-cultural communication contributes to the multicultural identity of Assam.

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Original Article

Promotion and Protection of Women's Human Rights in Assam: An Analysis

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Abstract

Women's human rights are an inseparable part of universal human rights and rest on the principles of equality, liberty, dignity, security, and non-discrimination. Although the Constitution of India and international human rights instruments recognise the equal status of women, gender-based inequality and violence continue to restrict women's effective enjoyment of rights. Assam presents a distinctive context for the study of women's human rights because of its ethnic and cultural diversity, large rural population, geographical difficulties, recurrent floods and erosion, tea garden economy, poverty, and unequal access to institutions. The present paper analyses the promotion and protection of women's human rights in Assam with reference to constitutional safeguards, legal measures, institutional mechanisms, and major contemporary challenges. The study adopts descriptive and analytical methods and is primarily based on secondary sources, including constitutional provisions, statutes, government reports, National Family Health Survey data, books, and institutional documents. It examines women's rights relating to life and dignity, equality, education, health, economic participation, marriage, workplace security, and freedom from violence. Particular attention is given to domestic violence, child marriage, human trafficking, witch-hunting, sexual harassment, cyber violence, and the vulnerability of rural, tribal, tea garden, flood-affected, and economically marginalised women. The study argues that India and Assam possess a substantial legal and institutional framework for protecting women's rights. The Assam State Commission for Women, Assam Human Rights Commission, judiciary, police, legal services institutions, One Stop Centres, Women Helpline, civil society organisations, and educational institutions perform significant roles. However, legal safeguards alone cannot guarantee substantive equality. Lack of awareness, patriarchal attitudes, poverty, geographical isolation, social stigma, economic dependence, and gaps in implementation remain important barriers. The paper concludes that the promotion of women's human rights in Assam requires a comprehensive rights-based approach combining legal protection, education, economic empowerment, gender-sensitive administration, accessible justice, healthcare, and community participation. Women's dignity and agency must become central principles of democratic governance and inclusive development in Assam.

Keywords: *Women's human rights, Assam, gender equality, women's protection, violence against women, human dignity, empowerment, social justice.*

Introduction

Human rights are universal rights inherent in every individual by virtue of being human. They are founded on dignity, liberty, equality, and justice. Historically, women have experienced discrimination in family, society, politics, economy, education, and public institutions. Patriarchal structures have often restricted women's mobility, bodily autonomy, property rights, and decision-making power. The Constitution of India provides a strong normative foundation for women's equality. The Preamble guarantees justice, liberty, and equality. Assam is a multicultural and geographically complex state. Women from Assamese, Bodo, Mising, Karbi, Rabha, Deori, Dimasa, Sonowal Kachari, tea garden, and many other communities contribute to agriculture, weaving, household economies, cultural preservation, education, and public life. The present paper critically analyses the promotion and protection of women's human rights in Assam. It examines the legal and institutional safeguards available to women and identifies major social and administrative challenges that affect the practical enjoyment of those rights.

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Scope of the Study

The study is confined primarily to the promotion and protection of women's human rights in Assam. It examines constitutional provisions, national legislation, state-level institutions, and selected support mechanisms relating to women. Special attention is given to domestic violence, child marriage, trafficking, witch-hunting, sexual harassment, and cyber abuse. The experiences of rural, tribal, tea garden, riverine, flood-affected, and economically disadvantaged women are also considered.

Objectives of the Study

The objectives of the study are:

1. To examine the concept and constitutional foundation of women's human rights.
2. To study the legal framework for the promotion and protection of women's rights in Assam.
3. To analyse major forms of human rights violations affecting women in Assam.
4. To examine the role of commissions, judiciary, police, legal services institutions, and support mechanisms.
5. To study women's rights relating to education, health, employment, and economic empowerment.
6. To examine the vulnerability of rural, tribal, tea garden, and disaster-affected women.
7. To identify major limitations in implementing women's human rights safeguards.
8. To suggest measures for strengthening women's dignity, equality, security, and agency.

Methodology

The study adopts descriptive and analytical methods. The descriptive method explains constitutional rights, laws, institutions, and major mechanisms concerning women. The research is qualitative and primarily based on secondary data. The Constitution of India, relevant legislation, government reports, National Family Health Survey material, books, and institutional documents have been consulted.

Significance of the Study

The study is significant because women's equality is a fundamental measure of democracy and social development. Constitutional recognition does not automatically produce substantive equality. The subject is particularly important in Assam because women's experiences differ according to location, community, occupation, education, and economic position. A woman living in a remote riverine area may face barriers different from those of an urban professional.

Discussion

Women's human rights include civil, political, economic, social, and cultural rights. Their protection requires both restraint and positive action by the state.

Constitutional and Legal Protection of Women's Rights

The Constitution is the primary legal foundation for women's human rights in Assam. Articles 14, 15, 16, and 21 protect equality, non-discrimination, equal opportunity, life, and dignity. The Protection of Women from Domestic Violence Act, 2005 is a significant rights-based law. It recognises physical, sexual, verbal, emotional, and economic abuse and provides civil remedies, including protection, residence, monetary, custody, and compensation-related reliefs (Government of India, 2005). The Prohibition of Child Marriage Act, 2006 and other criminal and social welfare laws also form part of the protective framework. Assam's Witch Hunting (Prohibition, Prevention and Protection) Act, 2015 is especially important because witch-branding and related violence attack life, dignity, equality, and personal security (Government of Assam, 2018).

Domestic Violence and the Right to Dignity

Domestic violence is a serious violation of women's human rights because it occurs within relationships and spaces expected to provide security. Physical assault, sexual abuse, humiliation, threats, and economic control can destroy autonomy and dignity.

National Family Health Survey findings have continued to identify spousal violence as a significant gender concern (Ministry of Health and Family Welfare, 2021). Domestic violence is often underreported because of stigma, economic dependence, fear of retaliation, concern for children, and family pressure. Protection Officers, police, service providers, courts, legal aid bodies, and One Stop Centres have important responsibilities. Yet women in remote areas may not know how to reach these mechanisms.

Child Marriage and the Rights of Girls

Child marriage is a major challenge to the rights of girls and young women in Assam. NFHS-related government statistics reported that 31.8 per cent of women aged 20–24 in Assam had married before age eighteen, compared with 23.3 per cent nationally (Ministry of Health and Family Welfare, 2023). Child marriage affects education, health, bodily autonomy, and personal development. Early marriage may lead to school dropout, early pregnancy, economic dependence, and restricted decision-making. The Prohibition of Child Marriage Act, 2006 provides a legal mechanism for prevention and punishment (Government of India, 2006). However, law enforcement alone cannot eliminate the practice.

Witch-Hunting and Gender-Based Violence

Witch-hunting represents a grave assault on human dignity. Persons branded as witches may face humiliation, exclusion, physical assault, displacement, and death. The Assam Witch Hunting (Prohibition, Prevention and Protection) Act, 2015 provides a specific legal response. Its significance lies in recognising witch-hunting as more than a question of superstition. Punishment is necessary, but prevention requires social transformation. Illness and unexplained events should be addressed through scientific awareness and accessible health services.

Human Trafficking and Exploitation

Human trafficking violates liberty, dignity, security, and bodily autonomy. Women and girls from economically vulnerable families may be exposed to deceptive recruitment, forced labour, sexual exploitation, or other abuse. Poverty, family distress, displacement, unemployment, and lack of safe livelihood opportunities can increase vulnerability. A rights-based response must include prevention, rescue, rehabilitation, and reintegration.

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Community awareness is essential because traffickers may operate through false promises of employment or marriage. Schools, colleges, local organisations, and women's groups can disseminate information concerning safe migration and suspicious recruitment.

Institutional Mechanisms for Women's Protection

The promotion and protection of women's rights require specialised institutions. The Assam State Commission for Women has an important role in examining grievances and issues affecting women. Legal services authorities are particularly important for women unable to afford representation. Free legal services and legal literacy help convert formal rights into accessible remedies. Institutional existence alone is insufficient. Women must know what services are available, where institutions are located, and how complaints may be submitted.

Women's Health as a Human Rights Issue

The right to health is closely connected with life and dignity. Women's health includes maternal healthcare, nutrition, reproductive health, menstrual hygiene, mental health, and access to general medical services. Women in remote rural, riverine, and tea garden areas may experience difficulties relating to distance, transport, poverty, and healthcare infrastructure. Pregnant women require timely antenatal care, institutional support, and emergency referral services. Reproductive rights require informed and voluntary decision-making. Women should have access to accurate information and quality services without discrimination or coercion.

Education and Human Rights Awareness

Education is both a human right and an instrument for exercising other rights. Educated women are generally better positioned to access information, participate in decision-making, and seek institutional support. Human rights education should be integrated into schools, colleges, and universities. Students should learn about constitutional equality, domestic violence, child marriage, workplace rights, cyber safety, and legal aid. Education must also challenge gender stereotypes. Men and boys should be included in gender sensitisation because women's human rights cannot be promoted effectively if equality is treated solely as a women's issue.

Economic Empowerment and Women's Agency

Economic dependence can restrict freedom and increase vulnerability to abuse. Economic empowerment is therefore an important dimension of human rights. Self-help groups, skill development, credit, entrepreneurship, and market linkages can strengthen economic agency. Yet empowerment should not be measured merely by enrolment in a programme. Property and inheritance rights are also significant. Ownership of land and assets can strengthen security and bargaining power.

Rights of Tribal, Tea Garden, Rural, and Disaster-Affected Women

Women's experiences in Assam are not uniform. Tribal and indigenous women often perform important roles in agriculture, weaving, and community life, but may still face problems concerning healthcare, education, trafficking, and institutional access.

Tea garden women constitute an important labouring population. Their concerns include wages, health, maternity protection, nutrition, housing, sanitation, and education for children. Flood and river erosion create additional vulnerabilities. Displacement can affect privacy, sanitation, menstrual hygiene, maternal healthcare, documentation, livelihood, and personal safety.

Workplace Rights and Sexual Harassment

Women's increasing participation in education, administration, business, and organised employment has made workplace rights increasingly important. Every woman has the right to work with dignity and without sexual harassment. The Sexual Harassment of Women at Workplace Act, 2013 requires mechanisms for prevention and redressal. Internal Committees are particularly important in colleges, universities, offices, and organised workplaces (Government of India, 2013). Employers should not treat compliance as a paperwork exercise. Regular awareness, confidential complaint procedures, impartial inquiries, and protection against retaliation are necessary for genuine workplace safety.

Cyber Violence and Emerging Challenges

Digital technology has expanded opportunities for women's education, employment, and public participation. At the same time, cyberstalking, impersonation, threats, non-consensual circulation of intimate material, and gender-based online abuse have emerged as significant concerns. Cyber violence can cause psychological harm and discourage women from participating in digital public spaces. Young women and students require awareness concerning privacy, digital evidence, and reporting procedures. Victim-blaming must be avoided. The misuse of technology by an offender should remain the focus of accountability.

Major Challenges and Measures for Strengthening Protection

The first major challenge is the gap between legal rights and social reality. Patriarchal attitudes may normalise control over women's mobility, marriage, education, and economic choices. Third, geographical barriers affect women in remote, char, hill, and flood-prone areas. Centralised institutions may remain inaccessible. Protection should therefore be decentralised, multilingual, survivor-centred, and timely. Regular legal literacy programmes, mobile outreach, gender-sensitive police training, effective institutional committees, safe shelters, counselling, and livelihood support are necessary.

Conclusion

The promotion and protection of women's human rights in Assam are essential to democratic governance, social justice, and inclusive development. The Constitution of India provides a strong framework of equality, dignity, liberty, and non-discrimination. The study demonstrates that women's human rights are multidimensional. Protection from physical violence is essential, but women's rights also include education, healthcare, economic agency, property, workplace dignity, digital safety, and meaningful

participation in decision-making. Assam possesses important institutional mechanisms, including commissions, courts, legal services institutions, police, and integrated support services. Nevertheless, their practical effectiveness depends upon awareness, accessibility, institutional capacity, coordination, and sensitive implementation. The promotion of women's human rights must move beyond a protection-only or welfare-only model. Women should be recognised as autonomous rights-holders and active participants in development. In conclusion, a comprehensive rights-based approach is essential for strengthening women's human rights in Assam. Law, administration, education, civil society, and community institutions must work together.

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I would like to express my sincere gratitude to all those who supported and encouraged me in the completion of this research paper entitled "Promotion and Protection of Women's Human Rights in Assam: An Analysis." I am deeply thankful to my institution, Purbanchal College, Silapathar, Assam, and the Department of Political Science for providing the academic environment and necessary support for undertaking this study. I am also grateful to all the scholars, researchers, authors, government institutions, and organisations whose valuable works, reports, legal documents, and other secondary sources contributed to this research.

Findings

1. Women's rights are an integral part of universal human rights.
2. The Constitution provides a strong foundation for women's equality and dignity.
3. Assam has significant legal and institutional mechanisms for women's protection.
4. The gap between formal rights and practical enjoyment remains a major challenge.
5. Domestic violence seriously affects dignity, autonomy, and personal security.
6. Social stigma and economic dependence contribute to underreporting of violence.
7. Child marriage remains a significant rights concern in Assam.
8. Early marriage adversely affects education, health, autonomy, and economic opportunity.
9. Witch-hunting violates life, dignity, equality, and security.
10. Human trafficking requires coordinated prevention, rescue, rehabilitation, and reintegration.
11. Integrated support and referral mechanisms are important for women affected by violence.
12. Legal aid is essential for economically and socially marginalised women.
13. Women's health must be recognised as a human rights concern.
14. Education is a major instrument of empowerment and rights awareness.
15. Economic dependence may increase vulnerability to abuse.
16. Women's unpaid and informal labour requires greater recognition.
17. Property and inheritance awareness can strengthen women's economic agency.
18. Tribal and indigenous women require culturally and linguistically accessible support.
19. Tea garden women experience intersecting labour, health, and gender concerns.
20. Flood and erosion create gender-specific human rights vulnerabilities.
21. Workplace sexual harassment affects equality and the right to work with dignity.
22. Institutional complaint committees must function effectively.
23. Cyber violence is an emerging challenge to women's dignity and security.
24. Human rights information should be disseminated in locally relevant languages.
25. Gender sensitisation should include men and boys.
26. Educational institutions can play a major role in rights promotion.
27. Institutional coordination is necessary for survivor-centred protection.
28. Economic empowerment is closely related to freedom and decision-making power.
29. A rights-based approach is more comprehensive than a welfare-only approach.
30. Women's dignity, equality, security, and agency are essential for Assam's inclusive development.

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Original Article

The Economic Impact of AI-Enabled Demand Forecasting on Fast Fashion Waste Reduction

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Abstract
The fast fashion industry has changed the way people buy clothes by offering fashionable products at affordable prices. However, producing large quantities of clothing in a short time often leads to overproduction and textile waste. Unsold garments increase business costs and create environmental problems. Artificial Intelligence (AI) has become an important tool for solving this issue through demand forecasting. AI helps companies predict customer demand by analysing sales data, shopping trends, weather conditions, and customer preferences. This allows businesses to produce the right quantity of clothing, reducing waste and improving profits. This paper explains how AI-enabled demand forecasting benefits the fast fashion industry by lowering production costs, reducing inventory, improving supply chain efficiency, and supporting sustainable business practices. The study is based on secondary data collected from books, journal articles, and industry reports. The findings show that AI not only improves business performance but also contributes to environmental protection by reducing unnecessary production.

Keywords: *Artificial Intelligence, Demand Forecasting, Fast Fashion, Sustainability, Inventory Management, Textile Waste*

Introduction

Fast fashion has become one of the most successful business models in the clothing industry. Companies introduce new designs every few weeks, allowing customers to buy fashionable clothes at affordable prices. While this model increases sales, it also creates a major challenge: many clothes are produced without knowing the exact customer demand. As a result, large quantities of garments remain unsold and eventually become waste. Overproduction affects both businesses and the environment. Companies spend more money on manufacturing, storing, and transporting unsold products. They also lose profits when they sell these products at discounted prices. At the same time, producing unnecessary clothing wastes water, energy, and raw materials while increasing pollution. Artificial Intelligence (AI) offers a practical solution to this problem. AI can analyse large amounts of data, including customer buying behaviour, online searches, weather forecasts, and social media trends. Using this information, AI predicts future demand more accurately than traditional forecasting methods. Better predictions help companies produce only what customers are likely to buy. As a result, businesses reduce inventory costs, improve profits, and minimize textile waste. AI also helps companies become more sustainable by reducing the unnecessary use of natural resources. Today, many leading fashion brands use AI to improve inventory planning and meet customer demand more effectively. The paper examines the economic impact of AI-enabled demand forecasting and explains how it helps reduce waste in the fast fashion industry.

Objectives of the Study

The objectives of this study are:

1. To understand the role of AI in demand forecasting.
2. To examine the causes of overproduction in fast fashion.
3. To study how AI helps reduce textile waste.
4. To identify the economic benefits of AI-enabled forecasting.
5. To explore the future role of AI in sustainable fashion.

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Research Methodology

This study is based on **secondary research**. Information has been collected from books, research articles, industry reports, and reliable online sources. The collected information has been analysed using a descriptive approach to understand the relationship between AI, demand forecasting, waste reduction, and business performance.

AI and Demand Forecasting in Fast Fashion

Demand forecasting means predicting how many products customers are likely to buy in the future. Earlier, companies mainly depended on historical sales records and manager experience. These methods often failed because fashion trends change quickly.

AI has improved forecasting by using technologies such as machine learning, predictive analytics, and big data analysis. AI studies customer behaviour, online shopping patterns, seasonal demand, weather conditions, and social media discussions to estimate future demand more accurately. For example, if customers begin searching online for a particular clothing style, AI can identify this trend early and help companies increase production of that product. Similarly, if demand is expected to fall, companies can reduce production before losses occur. This approach reduces forecasting errors and allows businesses to make faster and better decisions.

Economic Impact of AI-Enabled Demand Forecasting

AI-enabled demand forecasting provides several financial and operational benefits to fast fashion companies. One of the biggest advantages is the reduction of overproduction. When companies know how many products customers are likely to buy, they can manufacture only the required quantity. This reduces the number of unsold garments and lowers production costs. Another important benefit is better inventory management. Excess inventory requires warehouse space, transportation, insurance, and maintenance, all of which increase business expenses. AI helps companies maintain the right stock levels, reducing these costs and improving cash flow. AI also improves supply chain efficiency. Manufacturers, suppliers, and retailers can coordinate production more effectively because demand predictions are more accurate. This reduces delays, avoids unnecessary orders, and ensures that products reach stores at the right time. Businesses also benefit from fewer discounts. When companies produce too many products, they often sell them at reduced prices to clear inventory. Accurate forecasting allows more products to be sold at regular prices, increasing overall profitability.

Real-Life Applications

Several global fashion companies already use AI to improve demand forecasting. **Zara** uses AI to monitor customer purchases and quickly identify new fashion trends. Instead of producing large quantities in advance, the company manufactures smaller batches and adjusts production based on customer demand. This reduces unsold inventory and improves product availability. **H&M** uses AI to study customer preferences in different cities and countries. The company distributes products according to local demand, reducing unnecessary transportation and excess stock. **Nike** applies AI to forecast demand for footwear and sportswear. By analysing customer behaviour and sales trends, Nike improves inventory planning and reduces warehousing costs while ensuring popular products remain available.

These examples show that AI helps companies improve both business performance and sustainability.

Findings

The study identified several important findings:

1. AI improves the accuracy of demand forecasting by analyzing multiple data sources.
2. Better forecasting reduces overproduction and textile waste.
3. Companies save money by lowering production, storage, and transportation costs.
4. AI improves inventory management and supply chain efficiency.
5. Customer satisfaction increases because products are available when needed.
6. Sustainable production practices become easier to achieve with accurate forecasting.
7. Although AI requires investment and skilled employees, its long-term benefits are greater than its initial costs.

Conclusion

Fast fashion has made clothing more affordable and accessible, but it has also increased overproduction and textile waste. These problems affect both business profitability and the environment. Artificial Intelligence offers an effective solution by improving demand forecasting. AI analyses customer behaviour, sales data, weather conditions, and market trends to predict demand more accurately than traditional methods. This helps companies produce the right quantity of clothing, reducing waste and lowering business costs. Better forecasting also improves inventory management, strengthens supply chains, and increases profitability. At the same time, AI supports sustainability by reducing unnecessary production, saving natural resources, and lowering carbon emissions. While implementing AI requires investment and technical knowledge, the long-term economic and environmental benefits make it a valuable technology for the fashion industry. In conclusion, AI-enabled demand forecasting is helping the fast fashion industry become more efficient, profitable, and environmentally responsible. As AI technology continues to improve, it is expected to play an even greater role in creating a sustainable future for the global fashion industry.

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Conflicts of interest
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Original Article

Integrating Forensic Accounting into Sustainability Reporting for Enhanced Stakeholder Trust

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Abstract
The growing emphasis on Environmental, Social, and Governance (ESG) performance has transformed sustainability reporting into a critical element of corporate accountability and long-term value creation. Investors, regulators, customers, and other stakeholders increasingly rely on sustainability reports to assess an organization's environmental responsibility, social impact, and governance practices. However, the credibility of these reports has been challenged by incidents of greenwashing, selective disclosure, misleading ESG claims, and weak assurance mechanisms. Conventional financial audits primarily focus on financial statements and often lack the investigative procedures required to detect intentional manipulation in sustainability disclosures. Consequently, there is a growing need for more rigorous assurance approaches capable of improving the reliability and transparency of ESG reporting. This conceptual study examines how forensic accounting can be integrated into sustainability reporting to strengthen stakeholder trust and corporate governance. Drawing on contemporary literature relating to forensic accounting, sustainability reporting, ESG assurance, and corporate governance, the study develops a conceptual framework demonstrating how forensic accounting techniques—such as fraud risk assessment, forensic investigation, digital analytics, continuous monitoring, and internal control evaluation—can enhance the quality and credibility of sustainability disclosures. The study further explains this relationship through Stakeholder Theory, Agency Theory, Legitimacy Theory, and Fraud Triangle Theory. The findings suggest that integrating forensic accounting into sustainability reporting improves disclosure quality by reducing opportunities for greenwashing, strengthening governance structures, enhancing regulatory compliance, and increasing transparency and accountability. The study also highlights the role of emerging technologies, including artificial intelligence, blockchain, and big data analytics, in supporting effective forensic assurance. Overall, the paper contributes to the growing body of knowledge by proposing an integrated framework that positions forensic accounting as a strategic mechanism for improving ESG reporting and fostering long-term stakeholder trust.

Keywords: *Forensic Accounting, Sustainability Reporting, ESG Reporting, Stakeholder Trust*

Introduction

Corporate reporting has evolved considerably over the past two decades as organizations are increasingly expected to demonstrate accountability beyond financial performance. Modern businesses are evaluated not only on profitability but also on their environmental stewardship, social responsibility, and governance practices. Consequently, sustainability reporting has become an essential communication tool that enables organizations to disclose their Environmental, Social, and Governance (ESG) performance to a wide range of stakeholders. The growing adoption of international reporting frameworks, including the Global Reporting Initiative (GRI), the International Sustainability Standards Board (ISSB), and the European Union's Corporate Sustainability Reporting Directive (CSRD), reflects increasing global demand for transparent and standardized sustainability disclosures. Investors now incorporate ESG information into investment decisions, while regulators, consumers, and society expect organizations to provide accurate and reliable information regarding their sustainability performance. Despite these developments, the credibility of sustainability reporting remains a significant concern.

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Many organizations have been accused of overstating environmental achievements, selectively disclosing favourable information, or omitting material sustainability risks. Such practices, commonly described as greenwashing, reduce stakeholder confidence and undermine the effectiveness of ESG reporting as a governance mechanism. Since much sustainability information is qualitative and difficult to verify, traditional financial audits may not adequately detect intentional misstatements or manipulation. In this context, forensic accounting has emerged as a valuable discipline capable of strengthening sustainability assurance. Unlike conventional auditing, forensic accounting applies investigative techniques, professional scepticism, fraud risk assessment, and evidence-based analysis to detect irregularities and verify the authenticity of reported information. Integrating these techniques into sustainability reporting can improve transparency, enhance governance, and provide stakeholders with greater confidence in corporate disclosures. This study therefore explores the role of forensic accounting in enhancing the credibility of sustainability reporting. It proposes that integrating forensic accounting into ESG reporting can reduce fraud risks, improve disclosure quality, strengthen corporate governance, and ultimately enhance stakeholder trust.

Problem Statement

Although sustainability reporting has become a widely accepted corporate practice, concerns regarding the reliability of ESG disclosures continue to increase. Numerous organizations have faced allegations of overstating environmental achievements, understating social risks, and presenting misleading governance information. Such practices create information asymmetry between organizations and stakeholders and reduce confidence in sustainability reports. Traditional assurance approaches primarily focus on compliance with reporting standards and frequently lack the investigative procedures necessary to detect intentional manipulation or fraud. Consequently, organizations remain vulnerable to greenwashing and inaccurate sustainability disclosures. The absence of a structured forensic approach to ESG assurance highlights the need for stronger verification mechanisms capable of improving transparency, accountability, and stakeholder trust.

Research Gap

Existing research extensively examines forensic accounting in financial fraud detection and litigation support, while sustainability reporting literature largely focuses on ESG disclosure quality, integrated reporting, and corporate governance. However, limited research has explored the integration of forensic accounting within sustainability reporting.

Current literature provides insufficient guidance on the application of forensic techniques to detect ESG-related fraud, prevent greenwashing, and strengthen sustainability assurance. In addition, there is limited discussion regarding the use of emerging technologies such as artificial intelligence, blockchain, and big data analytics in forensic sustainability assurance. The absence of integrated conceptual frameworks and standardized assurance models indicates an important research gap that this study seeks to address.

Objectives of the Study

The primary objective of this study is to examine how forensic accounting can enhance the credibility of sustainability reporting and strengthen stakeholder trust.

The specific objectives are to:

1. Examine the role of forensic accounting in sustainability reporting.
2. Identify major fraud risks associated with ESG disclosures.
3. Evaluate how forensic accounting helps prevent greenwashing.
4. Assess the contribution of forensic accounting to corporate governance and transparency.
5. Examine the role of digital technologies in strengthening forensic sustainability assurance.
6. Develop a conceptual framework integrating forensic accounting with sustainability reporting.
7. Provide recommendations for organizations, regulators, and policymakers.

Research Questions

The study addresses the following research questions:

1. What role does forensic accounting play in sustainability reporting?
2. How can forensic accounting improve stakeholder trust in ESG disclosures?
3. Which forensic accounting techniques are most effective in detecting sustainability-related fraud?
4. How does forensic accounting reduce greenwashing and improve reporting transparency?
5. What role do emerging technologies play in strengthening forensic sustainability assurance?
6. What governance mechanisms support the successful integration of forensic accounting into sustainability reporting?

Theoretical Framework

This study is grounded in four complementary theories that explain how forensic accounting can improve the credibility of sustainability reporting and strengthen stakeholder trust.

1 Stakeholder Theory

Stakeholder Theory, proposed by Freeman (1984), argues that organizations are responsible not only to shareholders but also to employees, customers, suppliers, governments, investors, communities, and society. These stakeholders increasingly rely on Environmental, Social, and Governance (ESG) disclosures to assess an organization's commitment to sustainable business practices. The quality and credibility of sustainability reports therefore influence stakeholder confidence and organizational reputation. Integrating forensic accounting into sustainability reporting enhances the accuracy and reliability of ESG information through independent verification and fraud detection. As a result, organizations are better able to meet stakeholder expectations, strengthen accountability, and build long-term trust.

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2 Agency Theory

Agency Theory explains the conflict of interest that may arise between managers (agents) and shareholders (principals). Managers may have incentives to present overly positive sustainability information to improve corporate reputation, attract investment, or achieve performance-based rewards. Such behaviour increases information asymmetry and may lead to misleading ESG disclosures. Forensic accounting reduces these agency problems by independently examining sustainability data, identifying inconsistencies, and evaluating internal controls. This investigative approach improves transparency and supports more informed stakeholder decision-making.

3 Legitimacy Theory

Legitimacy Theory suggests that organizations seek public acceptance by demonstrating socially responsible behaviour. Sustainability reporting serves as an important mechanism for maintaining organizational legitimacy through the disclosure of environmental, social, and governance performance. However, exaggerated or misleading sustainability claims can damage public confidence and corporate reputation. Forensic accounting strengthens organizational legitimacy by ensuring that sustainability reports are supported by verifiable evidence and accurately reflect actual corporate performance. Consequently, organizations are more likely to maintain stakeholder confidence and regulatory compliance.

4 Fraud Triangle Theory

Fraud Triangle Theory identifies pressure, opportunity, and rationalization as the three primary factors that contribute to fraudulent behaviour. Sustainability reporting creates new opportunities for manipulation because many ESG indicators involve qualitative judgments and voluntary disclosures. Organizations may therefore engage in greenwashing, selective reporting, or intentional omission of negative information. Forensic accounting minimizes these opportunities through fraud risk assessment, continuous monitoring, investigative auditing, and evidence-based verification, thereby reducing the likelihood of fraudulent sustainability reporting.

Literature Review

Sustainability reporting has become an essential component of modern corporate reporting as organizations increasingly disclose information relating to environmental protection, social responsibility, ethical governance, and long-term value creation. International reporting frameworks such as the Global Reporting Initiative (GRI), International Sustainability Standards Board (ISSB), and Sustainability Accounting Standards Board (SASB) have contributed to greater consistency in ESG reporting. Nevertheless, researchers continue to report considerable variation in disclosure quality, with many organizations providing selective or incomplete sustainability information. One of the most significant challenges facing sustainability reporting is greenwashing, whereby organizations exaggerate environmental achievements or present misleading sustainability claims. Such practices reduce the credibility of ESG reports, mislead investors and regulators, and weaken stakeholder confidence. Since many sustainability disclosures involve qualitative information that is difficult to verify, conventional financial auditing alone is often insufficient to detect intentional manipulation or reporting bias. Forensic accounting has evolved beyond its traditional role in fraud investigation and litigation support to become an important mechanism for strengthening corporate governance and organizational transparency. Modern forensic accounting combines accounting expertise with investigative procedures, fraud examination, risk assessment, digital forensics, continuous auditing, and advanced data analytics. Unlike traditional auditors, forensic accountants adopt a sceptical approach that focuses on identifying irregularities, evaluating evidence, and detecting concealed fraud. The integration of forensic accounting into sustainability reporting offers several important benefits. First, forensic accountants conduct fraud risk assessments to identify areas vulnerable to manipulation, including carbon emissions reporting, waste management data, supply chain sustainability claims, and governance disclosures. Second, they verify ESG information through documentary evidence, operational records, interviews, and independent validation procedures. Third, forensic accounting strengthens internal controls by evaluating data collection processes, reporting systems, and governance mechanisms that support sustainability reporting. Technological innovation has further enhanced the effectiveness of forensic accounting. Artificial intelligence enables automated anomaly detection and predictive fraud analysis, while big data analytics supports continuous monitoring of large volumes of ESG information. Blockchain technology provides secure and tamper-resistant records that improve the traceability and reliability of sustainability data. Similarly, Internet of Things (IoT) devices generate real-time operational information relating to energy consumption, carbon emissions, and resource utilization, reducing opportunities for manual manipulation. Collectively, these technologies strengthen sustainability assurance and improve the quality of ESG reporting. Despite increasing academic interest in both forensic accounting and sustainability reporting, relatively few studies have integrated these fields into a comprehensive framework. Existing literature focuses primarily on financial fraud detection or general ESG disclosure quality, with limited attention given to forensic approaches for detecting sustainability-related fraud and preventing greenwashing. This study addresses this gap by proposing an integrated conceptual framework linking forensic accounting with sustainability reporting.

Research Methodology

This study adopts a conceptual qualitative research design based on a systematic review and synthesis of existing literature. Rather than collecting primary data, the research develops an integrated conceptual framework by analysing scholarly publications, professional reports, international reporting standards, and regulatory documents related to forensic accounting, sustainability reporting, ESG assurance, corporate governance, and fraud detection. Secondary data were obtained from peer-reviewed journal

articles, books, conference proceedings, reports issued by professional accounting bodies, and international sustainability reporting frameworks. Particular emphasis was placed on literature published between 2015 and 2026 to ensure that the study reflects recent developments in ESG reporting, forensic accounting practices, and emerging digital technologies. The literature was selected based on its relevance to forensic accounting, sustainability reporting, greenwashing, corporate governance, fraud prevention, artificial intelligence, blockchain technology, and digital assurance. Relevant studies were critically examined to identify recurring themes, conceptual relationships, research gaps, and practical implications. The collected literature was analysed using thematic analysis, comparative literature analysis, and conceptual synthesis. These techniques enabled the identification of common patterns regarding the role of forensic accounting in improving ESG reporting quality and stakeholder trust. The findings from the literature were subsequently integrated into a comprehensive conceptual framework illustrating the relationship between forensic accounting practices, enhanced sustainability reporting, and long-term stakeholder confidence.

The conceptual research design is appropriate because the integration of forensic accounting into sustainability reporting remains an emerging field with limited empirical evidence. By synthesizing existing knowledge, the study provides a theoretical foundation for future empirical investigations and offers practical insights for organizations, regulators, auditors, and policymakers seeking to strengthen sustainability assurance and corporate governance.

Results and Discussion

The conceptual analysis demonstrates that integrating forensic accounting into sustainability reporting significantly enhances the credibility, transparency, and reliability of Environmental, Social, and Governance (ESG) disclosures. Unlike conventional financial audits, which primarily focus on verifying financial statements and ensuring compliance with accounting standards, forensic accounting applies investigative procedures, professional scepticism, fraud risk assessment, and evidence-based verification to examine the authenticity of sustainability information. This broader and more analytical approach enables organizations to identify material misstatements, inconsistencies, and fraudulent reporting practices before sustainability reports are released. Consequently, the integration of forensic accounting contributes to higher-quality ESG disclosures that more accurately reflect an organization's environmental, social, and governance performance. A major finding of the study is that forensic accounting serves as an effective mechanism for reducing greenwashing and other forms of sustainability-related fraud. Greenwashing has become a major concern because organizations may exaggerate environmental achievements, selectively disclose favourable information, or omit negative sustainability impacts to improve their public image. Such practices undermine the credibility of ESG reporting and weaken stakeholder confidence. By applying forensic investigation techniques, examining supporting documentation, validating operational data, and cross-checking sustainability information with independent evidence, forensic accountants can detect misleading disclosures and reduce opportunities for manipulation. This investigative approach strengthens the integrity of sustainability reports and supports more informed decision-making by investors, regulators, and other stakeholders. The findings also indicate that integrating forensic accounting enhances corporate governance by strengthening internal control systems and improving organizational accountability. Effective governance requires accurate reporting, ethical leadership, sound risk management, and transparent decision-making. Forensic accounting contributes to these objectives by identifying weaknesses in ESG reporting processes, evaluating internal controls, assessing fraud risks, and recommending corrective measures. The independent verification provided by forensic accountants reduces information asymmetry between management and stakeholders, encourages responsible reporting practices, and reinforces board oversight of sustainability disclosures. As a result, organizations become better positioned to comply with regulatory requirements while maintaining higher standards of transparency and accountability. Another important outcome of the study is the growing contribution of digital technologies to forensic sustainability assurance. Emerging technologies such as Artificial Intelligence (AI), blockchain, big data analytics, and digital forensic tools have transformed the way organizations monitor and verify sustainability information. AI enables continuous monitoring of ESG data, automated anomaly detection, and predictive fraud analysis, allowing organizations to identify irregular reporting patterns more efficiently than traditional manual procedures. Blockchain technology enhances transparency by creating secure and tamper-resistant records of sustainability transactions, while big data analytics supports the examination of large volumes of operational and ESG information in real time. Together, these technologies improve the speed, accuracy, and effectiveness of forensic accounting and strengthen the reliability of sustainability reporting. The findings further suggest that improved sustainability reporting has a direct positive influence on stakeholder trust. Investors increasingly incorporate ESG performance into investment decisions, customers prefer organizations demonstrating genuine sustainability commitments, employees value ethical workplaces, and regulators expect transparent corporate disclosures. When sustainability reports are supported by forensic accounting procedures, stakeholders perceive the disclosed information as more reliable and credible. This enhanced confidence contributes to stronger corporate reputation, increased investor confidence, improved regulatory compliance, and long-term organizational sustainability. Consequently, forensic accounting should not be viewed solely as a fraud investigation tool but as a strategic governance mechanism that supports transparent and responsible corporate reporting. Overall, the conceptual framework developed in this study demonstrates that forensic accounting

strengthens sustainability reporting through fraud prevention, enhanced disclosure quality, stronger governance, and improved accountability. These improvements collectively reduce sustainability reporting risks, minimize greenwashing, and foster greater stakeholder confidence. The findings therefore support the proposition that integrating forensic accounting into ESG reporting can significantly enhance sustainable corporate governance and contribute to long-term organizational value creation.

Limitations of the Study

Although this study provides valuable insights into the integration of forensic accounting with sustainability reporting, several limitations should be considered when interpreting its findings. First, the study adopts a conceptual research design based entirely on the review and synthesis of existing literature. Since no primary data were collected through surveys, interviews, case studies, or experiments, the proposed framework has not been empirically validated. Future empirical studies are therefore required to test the relationships identified in this research across different organizational settings. Second, the study relies exclusively on secondary data obtained from academic journals, books, professional reports, and international reporting standards. The conclusions are therefore dependent on the quality, availability, and scope of existing literature. Any limitations within the reviewed studies may also influence the findings of this research. Third, the analysis is presented from a general corporate perspective and does not examine industry-specific applications of forensic accounting. The nature of sustainability reporting, ESG risks, and fraud opportunities may differ significantly across industries such as banking, manufacturing, healthcare, energy, and the public sector. Consequently, the proposed framework may require adaptation to suit different industrial contexts. Another limitation relates to the rapid evolution of sustainability reporting standards and regulatory requirements. International ESG reporting frameworks continue to develop, and future regulatory changes may influence the practical application of forensic accounting within sustainability assurance. As reporting standards become more standardized and mandatory, organizations may need to revise their assurance practices accordingly. Although the study discusses the growing importance of emerging technologies such as Artificial Intelligence, blockchain, big data analytics, and digital forensics, it does not empirically evaluate their implementation, cost-effectiveness, or operational challenges. The successful integration of these technologies depends on organizational resources, technological infrastructure, and the availability of skilled professionals. Furthermore, the study adopts a global perspective without focusing on country-specific legal, institutional, or regulatory environments. Differences in corporate governance systems, accounting standards, and enforcement mechanisms may influence the adoption and effectiveness of forensic accounting practices in different jurisdictions. Finally, while stakeholder trust is identified as the primary outcome of integrating forensic accounting into sustainability reporting, the study does not directly measure stakeholder perceptions. Future research involving investors, regulators, auditors, employees, customers, and sustainability professionals would provide stronger empirical evidence regarding the effectiveness of forensic accounting in enhancing confidence in ESG disclosures. Despite these limitations, the study offers a comprehensive conceptual foundation for understanding how forensic accounting can strengthen sustainability reporting. It also identifies important directions for future empirical research and provides practical guidance for organizations seeking to improve the transparency, credibility, and governance of their sustainability reporting practices.

Conclusion

The increasing importance of sustainability reporting has transformed corporate reporting by extending organizational accountability beyond financial performance to include environmental, social, and governance (ESG) responsibilities. As stakeholders increasingly rely on sustainability information for investment, regulatory, and strategic decisions, ensuring the credibility of ESG disclosures has become a critical challenge. However, incidents of greenwashing, selective reporting, and misleading sustainability claims have weakened stakeholder confidence and highlighted the limitations of conventional assurance practices. This study examined the integration of forensic accounting into sustainability reporting as a strategic mechanism for enhancing transparency, accountability, and stakeholder trust. The conceptual analysis demonstrates that forensic accounting extends beyond traditional fraud investigation by providing investigative procedures, fraud risk assessment, evidence-based verification, digital forensic techniques, and continuous monitoring that strengthen the reliability of sustainability disclosures. Through these practices, organizations can detect and prevent fraudulent reporting, reduce opportunities for greenwashing, and improve the overall quality of ESG information. The study further highlights that integrating forensic accounting into sustainability reporting strengthens corporate governance by improving internal controls, enhancing risk management, supporting ethical decision-making, and reducing information asymmetry between management and stakeholders. Reliable sustainability reporting not only enhances investor confidence and regulatory compliance but also contributes to improved corporate reputation, organizational legitimacy, and long-term business sustainability. The proposed conceptual framework demonstrates that forensic accounting functions as an independent assurance mechanism linking fraud prevention with high-quality sustainability reporting. The integration of emerging technologies such as Artificial Intelligence, blockchain, big data analytics, and digital forensics further strengthens the effectiveness of forensic accounting by enabling continuous monitoring, secure data verification, predictive fraud analysis, and real-time identification of reporting anomalies. Although this research is conceptual and based on secondary data, it contributes to the growing body of literature by integrating forensic accounting with

sustainability reporting within a comprehensive theoretical framework. The study addresses an important research gap and provides practical implications for corporate managers, auditors, forensic accountants, regulators, policymakers, and professional accounting bodies seeking to strengthen ESG assurance and corporate governance. In conclusion, forensic accounting should be regarded as an essential component of modern sustainability reporting rather than merely a tool for fraud investigation. Its integration into ESG reporting enhances disclosure credibility, reduces sustainability-related fraud, strengthens stakeholder trust, and supports responsible corporate governance. As sustainability reporting continues to evolve globally, the application of forensic accounting will play an increasingly important role in promoting transparency, accountability, and sustainable value creation for organizations and society.

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Original Article

From Burnout to Balance: Role of Vacation Tourism in Managing Workplace Stress

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Abstract
Stress and burnout are rapidly becoming commonplace issues in the workplace, impacting employees' health, productivity, and workplace performance in many industries. Although the concept of vacation tourism as a means of psychological recovery is gaining in popularity, the research has mainly dealt with occupational stress and vacation tourism as unrelated and distinct fields. This conceptual paper aims to fill this void by reviewing and summarizing 40 peer-reviewed studies from 2015 to 2025, and by drawing on the existing occupational psychology and tourism literature to provide a cohesive framework to connect workplace stressors, vacation tourism engagement, and the alleviation of workplace burnout. It is found that a high workload, job insecurity and role conflict are significant predictors of burnout and intention to leave the job in the workplace; vacation engagement, psychological detachment and sensory-emotional experiences are generally found to predict less fatigue, better emotional state and better cognitive functioning. The conceptual model presented in this paper is based on the recent developments in the field of tourism mental health and on a focus on sensory-emotional pathways to psychological wellbeing as mediators between vacation tourism engagement and mental health benefits, which ultimately lead to lower burnout rates and higher job performance. The authors of the paper question whether vacation length or frequency is significantly related to the restorative potential of vacations and suggest that it is more about the psychology of disconnection and the sensory of connection that takes place during vacations. The organizations interested in developing 'evidence-based wellness policies' as a mental health strategy not an administrative privilege as a means to provide vacation receives recommendations for implementation. The main limitation of the study is that the study is a conceptual study and in future, empirical validation of the study across various occupational and cultural context is suggested using mixed methods research design. This paper contributes to the field of Tourism Management and Organisational Psychology by strengthening the vacation tourism as a valid and scientific tool for the management of occupational stress.

Keywords: *Vacation tourism, workplace stress, burnout, employee mental health, psychological detachment, recovery experiences, occupational well-being*

Introduction

Stress in the workplace is not only a problem of the workplace; it is one of the most common 21st century work-engaged issues of our time and it's not just affecting people in one profession or industry but absolutely crippling people, both geographically and physically. Indeed, mental health is always included in the overall well-being research, because of the findings of (Prince et al., 2007) and (Gedecho & Kim, 2025) which has indicated that nearly 28% of the global burden of non-communicable disease could be attributed to neuropsychiatric disorders. In organizational environments, the chronic exposure of employees to job demands, such as excessive workload, job insecurity, role ambiguity, and customer incivility, has consistently been associated with a negative impact on employees' psychological well-being and organizational performance and with higher risk of burn out (Gedecho & Kim, 2025; Salama et al., 2022). Unmanaged work stress can have a negative impact on work burnout, which can then have a significant impact on the intention to leave the job, as (Salama et al., 2022) proved in a structural equation modelling of a sample of Egyptian hotel workers.

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Additionally, (Mangory et al., 2021) conducted a literature review of physician burnout and found that stress that goes unaddressed has been linked to negative work outcomes, making it important to implement stress-management programs across the entire healthcare system. The economic and human cost of burnout has become more and more a concern for organisations, so non-clinical – and readily available – approaches have been highlighted that can help restore employee health. Among them, vacation tourism has received an increasing empirical focus as it is a well-organized process of psychological adaptation from work fatigue. These findings corroborate with previous study by (Sinsky et al., 2024), which revealed that physicians with fewer vacation days or who did work-related activities during vacation had significantly higher rates of burnout. To support this, (Syrek et al., 2021) revealed that psychological detachment, relaxation and mastery during a vacation was correlated with the improvement of postvacation creativity and cognitive functioning in the workers. In addition, (Tement et al., 2020) suggested a randomized controlled approach that uses cognitive-behavioral and mindfulness-based interventions to enhance psychological detachment, highlighting that psychological detachment is trainable and measurable and is central to employee recovery. Building on this occupational psychology literature, there is a large body of tourism research that has investigated and conceptualized the psychological mechanisms that generate mental health benefits from leisure and nature-based experiences. Buckley and Cooper et al. (2022) proposed that, as part of the recovery from the pandemic, outdoor tourism can be a suitable tool for mental health care, while Guardini et al. (2023) found a significant increase in positive affect, vitality, optimism and gratitude after 3-day forest bathing retreats, empirically. (White et al., 2019) found a positive relationship between exposure to nature and health and wellbeing as measured by self-reports of health and wellbeing in a large-scale, single country, cross-sectional study, and (White et al.,2021) found that in a cross-national study, proximity to green and blue space was significantly related to mental health outcomes in 18 countries. Similarly, forest-therapy interventions have been proven to greatly decrease symptoms of depression and anxiety (Yeon et al., 2021), and short-term forest-therapy exposure has been shown to significantly improve mood states in general (Meneguzzo et al., 2021). Of natural tourism-related stimuli, sensory stimuli are known to induce anxiety and stress-reducing effects, which are not related to the other components of natural tourism (Ferraro et al., 2020; Stobbe et al., 2022).

In the last two years, two recent and directly relevant articles have significantly contributed to the theoretical underpinning of the integration of these two research streams: the organizational stress management and the tourism-based psychological recovery. Over the past two years, two new and directly relevant articles have made great contributions to the theoretical basis of the integration of these two streams of research: The organizational stress management and the tourism-based psychological recovery. In the vast conceptual review of mental health and well-being in tourism scholarship (Gedecho and Kim, 2025), three general areas of research emerged: the researcher's focus on tourists, the researcher's focus on employees, and the researcher's focus on communities, with the latter being the focus of this study. The researchers noted that the third stream of research, focusing on the community, had not been studied so much as it had been an incidental benefit to the employees, in terms of the workplace stressors and coping strategies examined in the literature. They also singled out the lack of quantitative measurement of the impact of tourism on mental health outcomes of employees, and recommended for interdisciplinary, experimental research to evaluate this impact (Gedecho & Kim, 2025). To complement this conceptual approach, (Zhong et al., 2025) provided strong empirical evidence of the psychological pathways through which there could be mental health benefits from tourism. The authors conducted a survey of 524 forest tourists in 27 forest reserves in China, and found statistically significant associations between sensory engagement, emotional response and self-perceived wellbeing measured using the validated psychometric instruments: Kessler Psychological Distress Scale (K10) and Personal Wellbeing Index (PWI). The positive correlation between sensory differences in the tourism experience and the stress reduction outcomes is important in terms of how tourism experiences that are structured might also serve as a stress reduction intervention beyond time off work (Zhong et al., 2025). Despite a growing body of evidence, there remains an important body of work that is missing from the literature. Past research on recovery from burnout has been primarily of a therapeutic and/or clinical nature, including CBT, mindfulness based stress reduction (MBSR) (Tement et al., 2020). Concurrently, there is very little psychological research supporting tourism that takes into account nature-based recreation or forest therapy and its connections with organizational stress, employee burnout syndromes or workplace recommendations (Subirana-Malaret et al., 2023). The integration of vacation tourism as a systematic approach to organizational stress management as opposed to vacation tourism as an incidental employee benefit has been observed to be almost blank in the literature for the link between the recovery mechanisms from tourism psychology and organizational stress recovery. This paper aims to fill this gap by suggesting a conceptual linkage of the literature on employee burnout and the literature on psychological recovery mechanisms associated with the tourist sector. Based on the theories and frameworks developed by (Gedecho and Kim, 2025) and (Zhong et al., 2025), and supported by empirical studies which show the benefits of vacation tourism for reducing burnout (Sinsky et al., 2024), the experiences of recovery (Syrek et al., 2021) and the role of nature in psychological restoration (White et al., 2019), this study examines the potential of vacation tourism as an evidence-based and viable approach to reducing workplace stress and burnout. This paper advances the field of tourism management and organisational psychology by highlighting the need to move vacation travel from being a peripheral, to a central, theoretically informed element of occupational mental health policy and

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future empirical research programs, and offers implications for designing occupational wellness policies.

Methodology

The design of this study is conceptual-cum-proposed empirical research design. First, the paper reviews the literature to establish a conceptual framework for the relationship between stress at work and vacation tourism, and then proposes some methodological parameters for future empirical research in the context of the research design used in the associated doctoral synopsis of the author on the theme of tourism and mental health.

Literature Search Strategy

To find relevant peer-reviewed literature from the year 2015 to 2025, a systematic narrative review approach was used. The search terms were used in combination on open access databases such as PubMed/PMC, PLOS ONE, BMC, Frontiers, Nature Portfolio journals, and MDPI journals. Inclusion of the studies was determined when they investigated (a) workplace stress, burnout, or mental health outcomes at work; (b) vacation, tourism, or nature-based recovery experiences; or (c) theoretical or psychometric models concerning the relationship between recovery experiences and mental health outcomes. Non-peer-reviewed studies, non-open access full-text studies and studies that were not directly relevant to the recovery from occupations or tourism were not included in the synthesis. The databases used, the keywords used, and the inclusion/exclusion of the 40 studies selected for this review are summarized in Table 1.

Table 1. Literature Search Strategy and Inclusion/Exclusion Criteria

Component	Description
Databases searched	PubMed/PMC, PLOS ONE, BMC, Frontiers, Nature Portfolio, MDPI
Search period	2015–2025
Keywords	Workplace stress, employee burnout, vacation, tourism, psychological detachment, recovery experiences, mental health
Inclusion criteria	Peer-reviewed, open-access, English-language studies on occupational stress/burnout OR tourism/vacation-based recovery
Exclusion criteria	Non-peer-reviewed sources, paywalled full text, studies unrelated to occupational or tourism-based recovery constructs
Total studies synthesized	40

Proposed research design and population

Based on the literature review, future empirical validation is proposed in this study, which integrates survey-based and psychometric approaches with physiological stress markers to gather both subjective and objective data on stress reduction, following the survey-based and psychometric approaches used in recent tourism–mental health research (Zhong et al., 2025). The target population consists of working adults aged between 18 and 65 years from various occupational sectors with a particular focus on the employees of the hospitality and healthcare sectors where burnout has been widely documented (Salama et al., 2022; Mangory et al., 2021). The proposed minimum number of participants is 100, which is gathered based on purposive sampling to achieve representation from age, sex and occupation and vacation-taking frequency.

Proposed Variables and Data Collection Tools

According to the proposed framework, workplace stressors (Workload, Job insecurity, and Role conflict) will be the independent variable, vacation/tourism engagement (Frequency, Duration, and Type) will serve as the mediating variable, and burnout reduction and job performance will be the dependent variables. A set of data collection instruments would involve validated psychological instruments such as the Kessler Psychological Distress Scale (K10), which has been widely employed to quantify recovery outcomes in tourism settings (Zhong et al., 2025), and pre- and post-vacation surveys, in line with the longitudinal survey methods adopted in previous vacation-recovery studies (Syrek et al., 2021).

Conceptual synthesis and framework

Based on the reviewed literature, the two domains of organizational antecedents of consequences of burnout (Sinsky et al., 2024; Tement et al., 2020) and tourism-induced recovery through the senses-emotions-wellbeing pathway (Zhong et al., 2025) were thematically synthesized. These domains were added to the conceptual framework proposed in Figure 1, which illustrates the pathway from workplace stressors to vacation/tourism engagement and sensory-emotional recovery to a decrease in burnout, better mental health, and better job performance. This model builds on that of (Zhong et al.,2025) and directly meets the unmet need identified by (Gedecho and Kim,2025) for more explicit models of the workplace context for structured vacation interventions in
stress management

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Figure 1. Proposed conceptual framework linking workplace stressors to job performance through vacation tourism engagement and sensory-emotional recovery mechanisms

Proposed Analysis Technique

The quantitative data would be analyzed using descriptive statistics, pre-post comparisons and structural equation modelling techniques for future empirical application to test the mediating effects of vacation engagement between workplace stressors and the outcomes of burnout. Paired comparison would be used to evaluate the changes in the physiological stress indicators before and after vacation.

Result & Discussion

The synthesis of 40 peer-reviewed studies yielded a convergence of three dominant thematic clusters which are summarized in Table 2: (1) organizational antecedents and consequences of workplace stress and burnout, (2) psychological recovery mechanisms in tourism and vacation and (3) integrative evidence between recovery experiences and lower levels of burnout and higher levels of occupational outcomes.

Cluster One: Antecedents of Workplace Stress and Burnout

In the first cluster, all the results showed that the excessive workload, job insecurity and role conflict were significant predictors of burnout, which in turn were significant predictors of negative employee outcomes. A structural equation modeling study of hotel employees (Salama et al.,2022) found that work stress significantly positively influenced the turnover intention of hotel employees with job burnout as a mediator (Mangory et al.,2021), in their review of physician burnout, also noted that unresolved occupational stress has been linked to poor professional and patient-care outcomes, further emphasizing the broad applicability of physician burnout as an occupational health issue beyond hospitality, into the healthcare industry and other professions that demand significant mental energy. These studies combine to support the view of burnout as a psychological and organizational reaction to unmanaged work stress, and to provide empirical evidence for examining the possibilities of interventions that are accessible to the workplace and can help to break the cycle of work stress.

Group Two: Psychological Recovery through Tourism and Vacation.

The second cluster reviewed evidence that shows that vacation engagement, psychological detachment, and sensory-emotional experiences while traveling are related to concrete changes in fatigue, emotional status, and cognitive functioning. Overall, physicians with fewer vacation days or those who kept engaging in work-related activities while on vacation also experienced higher rates of burnout (Sinsky et al. 2024), further highlighting the recovery benefits of true distance from work. In line with this, recovery experiences - such as relaxation, mastery and psychological detachment on vacation - were linked with greater post vacation creativity and cognitive functioning of employees by (Syrek et al.,2021), and the benefits of recovery were not limited to stress reduction, but were also found in domains related to performance. In addition, (Tement et al.,2020) developed a randomized controlled trial protocol that will specifically test and enhance employees' psychological detachment ability during the recovery process, highlighting that psychological detachment is a trainable, measurable construct that is not an incidental feature of time off, but a key component of employee recovery. In nature-based tourism, (Guardini et al.,2023) showed that the positive impact of forest bathing did not rely on the length of the vacation, as even a three-day forest-bathing retreat resulted in substantial enhancements in positive affect, vitality, optimism, and gratitude among participants. Complementarily, (Buckley and Cooper ,2022) made a more general claim that outdoor and nature-based tourism is a legitimate and accessible instrument in nature-based mental healthcare, especially pertinent in the context of the post-pandemic recovery. Within this group, (Zhong et al.,2025) analysed 524 forest tourists in 27 forest reserves in China and found statistically significant relationships between forest sensory experiences and psychological distress (using the Kessler Psychological Distress Scale (K10)) and self-perceived wellbeing (using the Personal Wellbeing Index (PWI), which are validated psychometric measures). Their discovery—that sensory differences in tourists activities are significantly linked to the stress-reduction outcomes of the tourism experience—provides a mechanism through which the structured nature of tourism experiences presents as effective recovery interventions beyond time-off from work.

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Table 2. Thematic Synthesis of Reviewed Literature

Theme	Key Findings	pporting Studies
Workplace stressors and burnout antecedents	Excessive workload, job insecurity, and role conflict significantly predict job burnout, which partially mediates the relationship between work stress and turnover intention.	Salama et al. (2022)
Consequences of unresolved occupational stress	Chronic, unmanaged workplace stress is linked to adverse professional outcomes, including burnout-driven declines in performance and patient/customer-facing quality of service.	Mangory et al. (2021)
Vacation as a protective factor against burnout	Physicians who took fewer vacation days, or who continued working during vacation, reported significantly higher burnout, highlighting genuine detachment as a protective mechanism.	Sinsky et al. (2024)
Psychological detachment and recovery interventions	Structured interventions combining cognitive-behavioral and mindfulness-based techniques significantly improve employees' ability to psychologically detach from work, enhancing overall well-being.	Tement et al. (2020)
Recovery experiences and cognitive outcomes	Recovery experiences during vacation—including relaxation, mastery, and psychological detachment—are associated with enhanced post-vacation creativity and cognitive functioning.	Syrek et al. (2021)
Nature-based tourism as a mental health tool	Outdoor and nature-based tourism functions as a legitimate, accessible tool within nature-based mental healthcare, particularly relevant during post-pandemic recovery.	Buckley & Cooper (2022)
Short-duration retreats and psychological restoration	Even brief, three-day forest-bathing retreats produce significant improvements in positive affect, vitality, optimism, and gratitude.	Guardini et al. (2023)
Sensory-emotional mechanism of tourism recovery	Sensory engagement during tourism experiences significantly predicts emotional response, which in turn significantly predicts self-perceived wellbeing, measured via validated psychometric scales (K10, PWI).	Zhong et al. (2025)
Conceptual gap between occupational and tourism research	Workplace stressors and structured coping strategies, including short-stay vacations, remain underexplored as deliberate interventions within tourism and mental health scholarship.	Gedecho & Kim (2025)
Sensory stimuli and stress-reduction	Specific sensory stimuli embedded within natural tourism settings, such as birdsong, independently produce anxiety- and stress-reducing effects.	Ferraro et al. (2020); Stobbe et al. (2022)

Table 2 provides a detailed summary of these thematic clusters and their associated key findings and studies that support the key findings and are part of the occupational stress literature and the tourism-recovery literature that was reviewed for this synthesis. Each theme is based on a set of empirical and conceptual contributions that are explicit and can be substantiated, as can be seen in Table 2.

Table 2 provides a structured and traceable evidence base for a conceptual framework that the authors propose for this paper, by summarizing the ten thematic clusters identified through synthesis and presenting each theme's key finding along with the relevant study or studies. Cluster Three is The Integrative Convergence Gap The third cluster of studies, the most innovative one, has come not from any one reviewed study, but rather from the integrative synthesis itself. Occupational stress studies have clarified the factors that make up burnout: workload, insecurity and role conflict; and tourism psychology studies have clarified the factors that make up recovery experiences: sensory engagement, emotional response and psychological detachment; but, comparatively few studies have explicitly linked these two pathways within a single, workplace-applicable frame of reference (Gedecho & Kim, 2025). This gap has been explicitly highlighted by (Gedecho and Kim , 2025) in their conceptual review of mental health and well-being in tourism scholarship, who pointed to the lack of studies investigating workplace stressors and coping

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strategies as planned, systematic interventions, and how they are not seen as benefits for employees as part of their jobs. This convergence gap is illustrated in Figure 2, which shows the two independent literature streams (occupational stress and burnout research, on one side; tourism-based psychological recovery research, on the other side) to be integrated in a single conceptual framework. The framework is not simply an juxtaposition of the two literatures, but rather introduces vacation tourism as the structural pathway bridging the workplace stressors to the psychological recovery outcomes, and creates a testable pathway that could be validated in future empirical research.

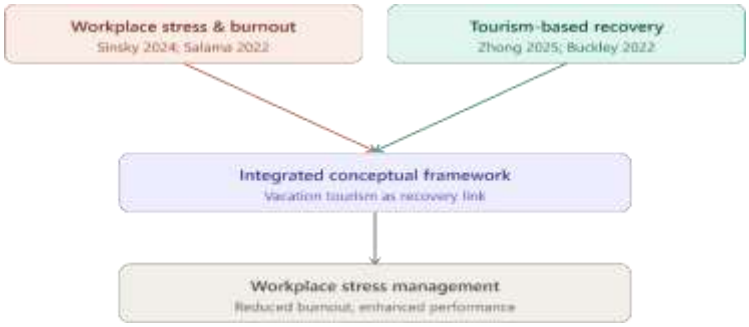

Figure 2. Convergence of occupational stress and tourism-recovery literature into an integrated conceptual framework.

The convergence of occupational stress and burnout literature with the tourism based psychological recovery literature is presented in the form of an integrated conceptual framework (Figure 2) and from which the proposed pathway is derived for managing occupational stress in the workplace. Together, these results indicate that vacation tourism is not a mere incidental employee benefit, but rather a theoretically sound, evidence-based intervention with the potential to tackle psychological and organizational stress in the workplace (Zhong et al., 2025). The synthesis also suggests that the effectiveness of such interventions might be tied to specific mechanisms (sensory diversity, psychological detachment, and structured recovery experiences) as opposed to length or frequency of vacation, with consequences for future organization design of employee wellness policies.

Discussion

The results of this conceptual synthesis have important implications for both organizational psychology and the field of tourism management research. First, the evidence examined indicates that vacation tourism can exert its most effective function as a recovery mechanism not just in terms of time away from work, but in terms of specific psychological processes (sensory engagement, emotional response, and psychological detachment) (Zhong et al., 2025). It's important to note that this is not just about the number of vacation days, but also about the nature of the vacation. Organizations aiming to use vacation as a stress-management tool should pay more attention to the quality of the detachment experienced by employees than simply the quantity of vacation time, as (Sinsky et al.,2024) found that work engagement during vacation is detrimental to the protective effect on burnout.

Secondly, the convergence gap between the literature of occupational stress and the literature of tourism psychology (Gedecho & Kim, 2025) implies that there is a need to conduct a more in-depth understanding of the potential of tourism-based interventions in current organizational wellness policies, which may be underutilizing them. The proposed conceptual framework (Figure 1) does so by providing the theoretical basis for vacation tourism engagement as the structural pathway between workplace stressors and better mental health outcomes, thereby providing an explicit rationale for structured vacation wellness programs for organizations, as opposed to vacation as a purely administrative benefit.Third, the synthesis points to those short yet structured interventions, like short retreats (Guardini et al., 2023), may be equally psychologically beneficial to longer vacations, and therefore could also be implemented on a larger, less costly scale for organizations that cannot give extended leaves. This synthesis, however, is still conceptual, and there is a lack of empirical testing of the proposed framework in a workplace specific sample, as well as a lack of any specific workplace examples of the mechanisms identified. Future research is required following the mixed-methods design suggested in this paper that will help determine whether the sensory-emotional pathway is comparable in organizations and in leisure tourism settings.

Conclusion

This paper aimed to explore the role of vacation tourism in the management of workplace stress by bringing together two seemingly unrelated fields of study, namely, the occupational stress/burnout literature and the literature on vacation tourism as a source of psychological recovery. This paper aimed to systematically review 40 peer-reviewed studies and identify consistent evidence of the factors of workplace stressors that predict employee burnout, and of vacation engagement, psychological detachment, and sensory-emotional experiences during travel that predict psychological recovery and improved well-being. Although largely developed independently, both strands of evidence suggest a common underlying message: Structured absences from work, combined with a strong psychological sense of detachment, can be understood as a measurable protective factor against the accumulation of job stress. The main contribution of this paper is the integrative conceptual

framework which brings vacation tourism from a mere incidental employee benefit to a defined, theoretically-informed tool for occupational stress management. This framework does not simply consider vacation policy as an administrative or legal duty; it sees vacation travel as an active recovery intervention that has a known psychological mechanism, such as sensory engagement, emotional processing, and cognitive unconsciously disengagement from work demands. The paper engages the tourism psychology and the burnout literature that has been developed in organizational psychology, with the aim of bridging a gap that has long existed between these two disciplines as the sensory-emotional recovery pathway developed in tourism psychology has seldom informed the other tradition. In practice, the results of this synthesis imply that organisations wishing to minimize burnout in the workplace should seek to focus more on the quality of psychological detachment employees experience when they are away from work rather than the amount of leave they receive. This involves encouraging authentic work-related disengagement during vacation, fostering planned recovery experiences of, for example, nature, and acknowledging that even short breaks can be valuable, psychologically speaking, when planned carefully. This is how vacation policies move beyond the idea of cost to one of investment in long-term employee well-being and organizational productivity for HR practitioners and policymakers. In theory, this paper also builds on current models in the field of tourism and mental health and provides a solid basis for future empirical studies. It is a conceptual paper so its main drawback is that there is no primary data collected specifically for working populations that are suffering from occupational burnout, but rather for general tourists in the population. This mixed-methods design presented in this paper provides a clear, feasible, and pragmatic follow-up method to meet this need by conducting empirical testing in the future. Given the scarcity of existing research on vacation tourism, future research should focus on samples from specific workplaces across a variety of occupations, longitudinal studies that measure recovery effects over time, and psychometric instruments that have been validated to thoroughly examine the possibility of systematically operationalizing vacation tourism as an evidence-based intervention to reduce burnout and improve employee outcomes. Finally, this paper calls for vacation tourism to be viewed as more than a leisure pursuit, but as an evidence-based and valid part of occupational mental health strategy worthy of continued research and organizational action.

Limitation of the Study

There are some limitations to be taken into consideration for this study. First, and most basically, this paper is conceptual in nature, not including any primary empirical data. The suggested model of association of stressors at work, involvement in vacation tourism, and reducing burnout has therefore not yet undergone statistical testing and validation in real working population, and the results of the model are still theoretical until they are examined empirically. Second, much of the evidence that was synthesized in this paper comes from general population studies of tourists and not from occupational burnout studies, specifically aimed at employees who suffered from occupational burnout. Consequently, the transferability of the recovery mechanisms observed for leisure tourists to stress situations in the workplace is only assumed and not substantiated. Third, the literature search was limited to open access, peer-reviewed articles published in the last decade (2015-2025), potentially missing out on relevant articles published since 2005 that are paywalled or articles from older foundational research that could have added support to the proposed framework. Fourth, across all the studies reviewed, cultural, occupational and geographical variability in the studies was not systematically controlled, so the generalizability of the proposed framework to other industries, countries and organizational contexts cannot be assumed and needs to be investigated through context-specific empirical studies.

Future Scope of the Study

Based on the conceptual framework presented in this paper, there are several directions for future research. Most importantly, future studies should empirically test the proposed framework with the mixed methods design described in the Methodology section, using validated psychometric measures, like the Kessler Psychological Distress Scale (K10) and Personal Wellbeing Index (PWI) as well as physiological stress measures, to collect both subjective and objective indicators of recovery. Second, future research should focus on employee groups with occupational burnout symptoms, not only on tourism contexts, but on other sectors like hospitality, health services, corporate services and education, in order to increase the applicability of the proposed sensory-emotional recovery pathway in the workplace. Third, longitudinal research designs are required to explore the duration of the psychological benefits of vacation tourism following the return journey to work, as well as assessing whether repeated and regular vacation engagement extends the duration of the protective effects of vacation on burnout over time compared to short-term vacation benefits. Finally, it is suggested that future studies should examine if different tourism experiences (e.g. nature based tourism, adventure tourism, cultural tourism, digital-detox tourism) have differential impact on recovery from burnout, so that the tourism industry can offer more effective and cost-efficient wellness tourism packages. Finally, cross-cultural and cross-organizational comparative studies are required to explore the moderating effect of the vacation tourism engagement and the reduction of burnout, especially as there is limited evidence in the current literature that is geographically or culturally representative. Finally, future studies should present the economic and organizational returns of the wellness interventions of tourism as a tool to validate the implementation of structural investment in employee vacation and recovery policies as an essential element of occupational wellness strategy and not as an additional value.

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Conflicts of interest
The authors declare that there are no conflicts of interest regarding the publication of this paper

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Original Article

Climate Change Adaptation: Building Resilient Communities through Sustainable Strategies, Innovation, and Nature-Based Solutions

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Abstract:

Climate change has become one of the most pressing global challenges of the twenty-first century, affecting ecosystems, economies, and societies across the world. Rising global temperatures, changing precipitation patterns, increasing frequency of extreme weather events, sea-level rise, biodiversity loss, and declining agricultural productivity have intensified the vulnerability of both developed and developing nations. While mitigation focuses on reducing greenhouse gas emissions, climate change adaptation emphasizes strengthening the capacity of human and natural systems to adjust to existing and anticipated climate impacts. Adaptation has emerged as a critical component of sustainable development because even with ambitious mitigation efforts, many climate impacts are now unavoidable. This paper examines the concept, significance, and strategies of climate change adaptation through an interdisciplinary perspective. It reviews the scientific understanding of adaptation, explores major climate risks affecting agriculture, water resources, health, infrastructure, biodiversity, and livelihoods, and discusses policy interventions and community-based approaches that enhance resilience. The study further highlights the importance of ecosystem-based adaptation, technological innovations, indigenous knowledge systems, climate-smart agriculture, and integrated disaster risk reduction. Drawing upon global experiences, the paper analyzes successful adaptation initiatives implemented in different regions and emphasizes the necessity of collaborative governance involving governments, scientific institutions, local communities, and international organizations. The findings suggest that effective adaptation requires long-term planning, adequate financing, inclusive decision-making, technological advancement, and continuous monitoring. Strengthening adaptive capacity will not only reduce climate-related risks but also contribute to achieving the Sustainable Development Goals (SDGs), enhancing environmental sustainability, and ensuring socio-economic resilience. The paper concludes that adaptation should no longer be viewed as a supplementary response but as a central pillar of climate-resilient development planning worldwide.

Keywords:

Climate Change, Adaptation, Resilience, Sustainable Development, Nature-Based Solutions, Climate-Smart Agriculture, Disaster Risk Reduction, Community Participation.

Introduction:

Climate change represents one of the most significant environmental, social, and economic challenges confronting humanity today. Scientific evidence demonstrates that global average temperatures have increased substantially due to anthropogenic greenhouse gas emissions resulting from industrialization, urbanization, deforestation, and unsustainable consumption patterns. These climatic changes have accelerated the occurrence of floods, droughts, cyclones, heatwaves, glacier retreat, forest fires, and sea-level rise, thereby threatening human well-being and ecological stability. Although international efforts have focused extensively on climate change mitigation through emission reduction strategies, it has become increasingly evident that mitigation alone cannot prevent all future climate impacts. Many climatic changes are already irreversible due to historical emissions, making adaptation an indispensable strategy for reducing vulnerability and enhancing resilience. Climate change adaptation refers to adjustments in ecological, social, and economic systems in response to actual or expected climatic stimuli and their effects. It aims to minimize damages while maximizing opportunities arising from changing climatic conditions. The significance of adaptation has gained global recognition through international agreements such as the Paris Agreement (2015), which identifies adaptation as a global goal alongside mitigation.

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Adaptation is particularly crucial for developing countries where dependence on climate-sensitive sectors such as agriculture, fisheries, forestry, and water resources is considerably higher. Limited financial resources, inadequate infrastructure, poverty, and institutional constraints further increase vulnerability. India presents an important example of climate vulnerability. The country experiences diverse climatic conditions ranging from Himalayan ecosystems to coastal regions, arid deserts, and tropical forests. Increasing heatwaves, irregular monsoons, glacier melting, cyclonic storms, groundwater depletion, and changing agricultural productivity significantly influence food security, public health, rural livelihoods, and economic development. Similar challenges are observed across South Asia, Africa, Latin America, and Small Island Developing States (SIDS). Climate adaptation therefore encompasses a broad range of actions including infrastructure development, climate-resilient agriculture, ecosystem restoration, disaster preparedness, early warning systems, water conservation, policy reforms, technological innovation, insurance mechanisms, and community participation. Effective adaptation combines scientific knowledge with indigenous practices and local experiences to build long-term resilience.

This paper aims to provide a comprehensive understanding of climate change adaptation by reviewing theoretical concepts, practical strategies, policy frameworks, and successful international case studies. It further discusses emerging adaptation approaches that support sustainable development and strengthen resilience against future climate uncertainties.

Objectives of the Study:

The study has been designed with the following objectives:

1. To examine the concept and importance of climate change adaptation.
2. To identify the major impacts of climate change on natural and human systems.
3. To analyze various adaptation strategies adopted across different sectors.
4. To evaluate successful international and national adaptation practices through case studies.
5. To recommend policy measures for strengthening climate resilience and sustainable development.

Research Methodology:

The present study is primarily based on a qualitative research approach employing extensive secondary data analysis. Information has been collected from peer-reviewed journal articles, reports published by international organizations, government documents, policy papers, conference proceedings, books, and scientific publications related to climate change adaptation. Reports published by leading organizations such as the Intergovernmental Panel on Climate Change (IPCC), the United Nations Framework Convention on Climate Change (UNFCCC), the World Bank, the Food and Agriculture Organization (FAO), and the United Nations Environment Programme (UNEP) have been extensively reviewed. Comparative analysis and case study methods have been used to understand adaptation practices implemented in different countries. The study also incorporates conceptual analysis to explain emerging adaptation approaches and resilience-building strategies.

Literature Review:

Climate change adaptation has evolved as a major research area during the past three decades. Early studies mainly emphasized vulnerability assessment and disaster response. However, contemporary research recognizes adaptation as a dynamic and continuous process involving governance, technology, social equity, ecosystem management, and sustainable development. The Intergovernmental Panel on Climate Change (IPCC) defines adaptation as the process of adjustment to actual or expected climate and its effects to moderate harm or exploit beneficial opportunities. Recent assessment reports highlight that adaptation is essential because many climate impacts have already become unavoidable despite global mitigation efforts. Research by Adger (2006) emphasizes that adaptive capacity depends upon economic development, institutional effectiveness, social capital, technological access, and education. Communities possessing stronger governance systems generally demonstrate higher resilience during climatic disasters. Smit and Wandel (2006) argue that adaptation should be viewed as a continuous learning process rather than a one-time intervention. Their research highlights the significance of integrating scientific information with indigenous knowledge to improve adaptation planning.

The World Bank (2021) identifies climate-resilient infrastructure, improved water management, ecosystem restoration, and agricultural diversification as major adaptation priorities, particularly in developing countries. The Food and Agriculture Organization has introduced the concept of Climate-Smart Agriculture (CSA), which simultaneously increases agricultural productivity, enhances resilience, and reduces greenhouse gas emissions wherever possible. Nature-based solutions have recently emerged as an innovative adaptation strategy. According to the International Union for Conservation of Nature (IUCN), restoring forests, wetlands, mangroves, and grasslands can substantially reduce climate risks while improving biodiversity conservation. Several studies also demonstrate the importance of community-based adaptation. Local participation enhances ownership, ensures cultural acceptance, and improves long-term sustainability of adaptation measures. Indigenous communities often possess valuable ecological knowledge accumulated through generations, contributing significantly to climate resilience. Recent literature further emphasizes that adaptation should be integrated into national development planning rather than being implemented as isolated environmental projects. Cross-sectoral coordination among governments, research institutions, private organizations, and civil society remains essential for successful adaptation.

Climate Change Impacts Across Different Sectors:

Climate change affects nearly every component of the Earth's natural and human systems. The increasing concentration of greenhouse gases has accelerated global warming, leading to significant changes in climatic conditions. These impacts are not limited to environmental degradation but also influence economic development, food security, public health, infrastructure, and social stability. The intensity and frequency of climate-related disasters have increased over recent decades, making adaptation an urgent necessity.

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1 Agriculture and Food Security:

Agriculture is among the most climate-sensitive sectors because crop production depends heavily on temperature, rainfall, soil moisture, and seasonal weather patterns. Rising temperatures shorten crop-growing periods, reduce crop yields, increase evapotranspiration, and encourage the spread of pests and diseases. Irregular monsoon rainfall causes both floods and droughts, directly affecting farmers' livelihoods. Developing countries face greater risks because a large proportion of their population depends on agriculture for employment and income. Smallholder farmers often have limited access to irrigation, improved seeds, insurance, and climate information, increasing their vulnerability.

Major adaptation measures include:

1. Climate-smart agriculture
2. Drought-resistant crop varieties
3. Crop diversification
4. Precision farming
5. Organic farming practices
6. Efficient irrigation systems
7. Weather-based crop advisory services
8. Agricultural insurance

These practices improve productivity while reducing climate-related risks.

2 Water Resources:

Climate change has significantly altered the global hydrological cycle. Many regions experience declining groundwater levels, glacier retreat, changing river flows, and increasing water scarcity. Conversely, intense rainfall events produce severe floods that damage settlements, agriculture, and infrastructure. Urbanization further intensifies water stress through increasing demand and pollution.

Adaptation strategies include:

1. Rainwater harvesting
2. Watershed management
3. Groundwater recharge
4. Smart irrigation technologies
5. Wastewater recycling
6. Reservoir management
7. River basin planning
8. Community water governance

Integrated Water Resource Management (IWRM) has become an internationally accepted framework for sustainable water adaptation.

3 Human Health:

Climate change directly and indirectly affects public health through heatwaves, air pollution, changing disease patterns, malnutrition, and mental health issues. Rising temperatures increase cases of heatstroke, dehydration, and cardiovascular diseases. Changing rainfall patterns create favorable conditions for vector-borne diseases such as malaria and dengue fever. Floods contaminate drinking water supplies, increasing outbreaks of waterborne diseases including cholera and diarrhea.

Health adaptation requires:

1. Climate-resilient healthcare systems
2. Disease surveillance
3. Early warning systems
4. Heat action plans
5. Safe drinking water
6. Public awareness campaigns
7. Emergency medical preparedness

Strengthening healthcare infrastructure significantly reduces climate-related mortality.

4 Biodiversity and Ecosystems:

Climate change threatens forests, wetlands, coral reefs, grasslands, mountains, and coastal ecosystems. Species migration, habitat loss, coral bleaching, forest fires, and ecosystem degradation are becoming increasingly common.

Healthy ecosystems provide numerous ecosystem services including:

1. Carbon sequestration
2. Flood regulation
3. Water purification
4. Soil conservation
5. Pollination
6. Livelihood support

Protecting biodiversity therefore contributes directly to climate adaptation.

5 Urban Areas and Infrastructure:

More than half of the world's population currently lives in urban areas. Cities face multiple climate-related risks including:

1. Urban flooding
2. Heat islands
3. Coastal flooding
4. Water scarcity
5. Infrastructure damage
6. Energy disruptions
7. Urban adaptation includes:
8. Green buildings
9. Climate-resilient infrastructure
10. Urban forests
11. Sustainable drainage systems
12. Flood-resilient transport networks
13. Smart city planning
14. Climate-sensitive land-use policies

Cities that integrate adaptation into urban planning become more resilient and economically sustainable.

Types of Climate Change Adaptation:

Climate adaptation can be classified into several categories depending on timing, planning, and implementation.

1 Anticipatory (Proactive) Adaptation:

These measures are implemented before climate impacts occur.

Examples include:

1. Coastal embankments
2. Drought preparedness plans
3. Climate-resilient infrastructure
4. Improved building codes
5. Early warning systems

Proactive adaptation reduces long-term economic losses.

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2 Reactive Adaptation:

Reactive adaptation occurs after climate disasters have already happened.

Examples include:

1. Post-flood reconstruction
2. Emergency drought relief
3. Disaster rehabilitation
4. Infrastructure repair

Although necessary, reactive adaptation is generally more expensive than anticipatory adaptation.

3 Autonomous Adaptation:

Individuals, farmers, and local communities often adjust independently without government intervention.

Examples:

1. Changing crop calendars
2. Using local drought-resistant varieties
3. Diversifying income sources
4. Traditional water conservation methods

Such adaptation is often based on indigenous knowledge.

4 Planned Adaptation:

Governments and institutions design long-term adaptation policies based on scientific evidence.

Examples include:

1. National Adaptation Plans
2. Climate policies
3. Disaster management frameworks
4. Coastal zone management
5. National irrigation missions

Planned adaptation provides systematic and coordinated responses.

Climate Change Adaptation Strategies:

Successful adaptation requires integrating environmental, economic, technological, and social approaches.

1 Ecosystem-Based Adaptation (EbA):

Ecosystem-Based Adaptation utilizes biodiversity and ecosystem services to reduce climate vulnerability.

Examples include:

1. Mangrove restoration
2. Forest conservation
3. Wetland protection
4. River restoration
5. Watershed development
6. Agroforestry

Benefits include:

1. Reduced flood risk
2. Increased biodiversity
3. Carbon sequestration
4. Improved livelihoods
5. Enhanced water security

EbA is often more cost-effective than purely engineering-based solutions.

2 Community-Based Adaptation (CBA):

Community participation remains essential because local people understand their environment better than external agencies.

Community-based adaptation emphasizes:

1. Local decision-making
2. Indigenous knowledge
3. Women's participation
4. Capacity building
5. Participatory planning
6. Social inclusion

Communities become active partners rather than passive beneficiaries.

3 Climate-Smart Agriculture (CSA):

Climate-smart agriculture simultaneously pursues three objectives:

1. Increasing agricultural productivity.
2. Building climate resilience.
3. Reducing greenhouse gas emissions wherever possible.

Major CSA practices include:

1. Precision agriculture
2. Drip irrigation
3. Crop diversification
4. Integrated pest management
5. Conservation agriculture
6. Organic farming
7. Agroforestry
8. Improved livestock management

CSA strengthens food security while enhancing adaptive capacity.

4 Nature-Based Solutions (NbS):

Nature-Based Solutions have gained global recognition because healthy ecosystems naturally reduce climate risks.

Examples include:

1. Mangrove restoration protecting coastal communities
2. Urban forests reducing heat islands
3. Green roofs lowering urban temperatures
4. Wetlands controlling floods
5. River restoration improving water quality

Nature-based solutions generate multiple environmental and socio-economic benefits simultaneously.

8. Technological Innovations Supporting Climate Adaptation:

Technology is transforming climate adaptation through improved monitoring, forecasting, planning, and decision-making.

Major technological innovations include:

Geographic Information Systems (GIS)

GIS supports:

1. Hazard mapping
2. Flood-risk assessment
3. Land-use planning
4. Resource management
5. Vulnerability analysis

Remote Sensing

Satellite imagery enables:

1. Forest monitoring
2. Drought assessment
3. Glacier monitoring
4. Crop health analysis
5. Coastal change detection

Artificial Intelligence (AI)

Artificial intelligence assists in:

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1. Climate prediction
2. Crop advisory systems
3. Flood forecasting
4. Pest monitoring
5. Disaster response planning

Internet of Things (IoT)
IoT devices monitor:
1. Soil moisture
2. Water quality
3. Weather conditions
4. Smart irrigation systems

Early Warning Systems
Modern forecasting systems provide timely information regarding:
1. Cyclones
2. Floods
3. Heatwaves
4. Heavy rainfall
5. Drought conditions

Early warnings significantly reduce disaster-related mortality and economic losses.

Table 1. Sector-wise Climate Change Adaptation Measures

Sector	Major Climate Risks	Key Adaptation Measures
Water	Scarcity, floods	Rainwater harvesting, watershed management
Health	Heatwaves, diseases	Heat action plans,disease surveillance
Urban Areas	Flooding, heat islands	Green infrastructure,resilient urban planning
Forest	Biodiversity loss	Afforestation, ecosystem restoration
Coastal Areas	Sea-level rise	Mangrove restoration, coastal embankments

9. Case Studies of Climate Change Adaptation:
Case studies provide practical evidence of how climate adaptation strategies are implemented under different environmental, economic, and governance conditions. The following examples from India, Bangladesh, and the Netherlands demonstrate that successful adaptation requires a combination of scientific innovation, strong institutions, community participation, and long-term planning.

Case Study 1: Climate Change Adaptation in India – Building Resilience through Integrated Approaches
Background
India is among the world's most climate-vulnerable countries due to its large population, geographical diversity, dependence on monsoon rainfall, extensive coastline, and significant reliance on agriculture. Climate-related disasters such as floods, droughts, cyclones, heatwaves, glacier retreat, and changing rainfall patterns have become increasingly frequent during recent decades. Agriculture contributes significantly to rural livelihoods, making millions of farmers highly vulnerable to climatic variability. Simultaneously, rapid urbanization has increased the exposure of cities to flooding, water scarcity, and heat stress.

Major Adaptation Initiatives:
National Action Plan on Climate Change (NAPCC)
The Government of India introduced the National Action Plan on Climate Change (NAPCC) to strengthen national resilience through eight national missions, including:

National Water Mission:
National Mission for Sustainable Agriculture
1. Green India Mission
2. National Mission on Sustainable Habitat
3. National Solar Mission

These missions integrate climate adaptation into development planning.

Climate-Smart Agriculture
Indian agricultural institutions have promoted:
1. Drought-tolerant crop varieties
2. Efficient irrigation technologies
3. Crop diversification
4. Soil health management
5. Weather-based advisory services

Farmers increasingly receive weather forecasts through mobile applications, enabling better decisions regarding sowing, irrigation, and harvesting.

Heat Action Plans
Cities such as Ahmedabad have introduced Heat Action Plans that include:
1. Early warning systems
2. Public awareness campaigns
3. Cooling shelters
4. Medical preparedness
5. Coordination among government departments

These measures have significantly reduced heat-related mortality. Community-Based Water Conservation
Several states have revived traditional water harvesting systems, including:
1. Check dams
2. Farm ponds
3. Watershed development
4. Rainwater harvesting

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These initiatives improve groundwater recharge and increase agricultural resilience.

Outcomes:

India's adaptation experience demonstrates that combining policy support, technological innovation, and community participation significantly enhances resilience. However, financial constraints, regional disparities, and increasing climate extremes continue to present major challenges.

Case Study 2: Bangladesh – Living with Floods and Cyclones

Background

Bangladesh is internationally recognized as one of the world's most climate-vulnerable countries. Its low elevation, dense population, and extensive river systems make it highly susceptible to:

1. Cyclones
2. River flooding
3. Coastal erosion
4. Sea-level rise
5. Salinity intrusion

Despite these challenges, Bangladesh has become a global leader in climate adaptation.

Adaptation Measures

1. Cyclone Early Warning Systems
2. The government established advanced forecasting systems that provide timely evacuation warnings before cyclones.
3. Thousands of trained community volunteers assist emergency evacuation and disaster response.
4. Cyclone Shelters
5. More than four thousand multipurpose cyclone shelters have been constructed. These shelters serve as: Schools during normal periods, Safe evacuation centers during disasters

They have dramatically reduced cyclone-related deaths compared to previous decades.

Floating Agriculture

Farmers have developed floating gardens made from water hyacinths and organic materials.

These floating beds enable vegetable cultivation during prolonged flooding.

The technique:

1. Increases food security
2. Protects livelihoods
3. Utilizes indigenous knowledge
4. Requires minimal external investment
5. Coastal Mangrove Restoration, Mangrove plantations reduce:

1. Coastal erosion
2. Storm surges
3. Wind damage
4. They simultaneously improve biodiversity and fisheries.

Lessons Learned

Bangladesh demonstrates that relatively low-cost, community-centered adaptation strategies can substantially reduce disaster risks when supported by effective governance and early warning systems.

Case Study 3: The Netherlands – Engineering Climate Resilience

Background

Nearly one-third of the Netherlands lies below sea level. Historically, flooding has represented one of the country's greatest environmental challenges. Instead of merely resisting water, Dutch policy increasingly focuses on "Living with Water."

Major Adaptation Strategies

Delta Programme

The Delta Programme is a long-term national strategy designed to protect the country against flooding while ensuring freshwater availability. Its planning horizon extends over several decades, integrating scientific research, engineering, and governance.

Room for the River Programme

Rather than constructing higher embankments everywhere, Dutch engineers expanded floodplains by:

1. Relocating dikes
2. Creating overflow channels
3. Restoring natural river systems

This allows rivers to safely accommodate higher water volumes.

Climate-Resilient Urban Design

Cities increasingly incorporate:

1. Green roofs
2. Urban parks
3. Water plazas
4. Permeable pavements
5. Rainwater storage

These measures reduce urban flooding while improving environmental quality.

Advanced Flood Forecasting

The Netherlands utilizes sophisticated hydrological models, satellite monitoring, and real-time forecasting systems for flood prediction and emergency response.

Outcomes:

The Dutch experience illustrates that long-term planning, scientific innovation, substantial investment, and integrated governance can transform climate vulnerability into resilience.

Many countries now study Dutch adaptation practices while designing their own climate strategies

.10. Comparative Analysis of International Case Studies

Country	Major climate Risks	Adaptation Approach	Key lesson
India	Droughts, heatwaves, floods	Climate-smart agriculture, Heat Action Plans, water conservation	Integrated national planning with local participation
Bangladesh	Cyclones, flooding, sea-level rise	Early warning systems, cyclone shelters, floating agriculture	Community-based adaptation saves lives

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Netherlands	River flooding, sea-level rise	Delta Programme, Room for the River, resilient urban planning	Long-term investment reduces future risks

11. Challenges to Climate Change Adaptation:

Despite increasing awareness, numerous barriers continue to limit effective adaptation worldwide.

1 Financial Constraints:

1. Many developing countries lack sufficient financial resources to implement climate adaptation projects
2. Large-scale infrastructure, ecosystem restoration, and disaster management require significant long-term investments.
3. Climate finance remains unevenly distributed across regions.

2 Institutional Weakness:

Weak governance, fragmented institutions, and poor coordination often delay adaptation implementation.

Successful adaptation requires cooperation among:

1. National governments
2. Local governments
3. Scientific institutions
4. NGOs
5. Private sector
6. Local communities

3 Technological Limitations

Many vulnerable regions lack:

1. Weather monitoring systems
2. Climate databases
3. GIS infrastructure
4. Remote sensing facilities
5. Digital communication networks

Technology transfer remains an important international priority.

4 Social Inequality

Climate impacts disproportionately affect:

1. Women
2. Children
3. Elderly populations
4. Indigenous communities
5. Smallholder farmers
6. Coastal populations

Inclusive adaptation policies are therefore essential.

5 Limited Awareness

Many communities remain unaware of:

1. Climate risks
2. Adaptation options
3. Government support programmes
4. Disaster preparedness

Education and public awareness significantly improve adaptive capacity.

6 Policy Fragmentation:

Climate adaptation is frequently treated separately from:

1. Agriculture
2. Urban planning
3. Water management
4. Disaster management
5. Biodiversity conservation
6. Integrated policy frameworks produce better outcomes.

12. Emerging Trends in Climate Change Adaptation:

1. Future adaptation is increasingly influenced by technological innovation and interdisciplinary collaboration.
2. Important emerging trends include:
3. Artificial Intelligence for climate prediction
4. Big Data analytics
5. Digital climate advisory platforms
6. Smart irrigation systems
7. Carbon-smart agriculture
8. Nature-based urban planning
9. Ecosystem restoration
10. Climate-resilient infrastructure
11. Community-led adaptation
12. Climate risk insurance
13. Blue-Green Infrastructure
14. Climate-resilient supply chains

These innovations are transforming adaptation from reactive disaster management toward proactive resilience building.

13. Discussion:

The comparative analysis demonstrates that there is no universal adaptation model applicable to every country. Adaptation strategies must reflect local climatic conditions, socio-economic realities, governance structures, and ecological characteristics. India emphasizes integrated national planning and climate-smart agriculture, Bangladesh showcases the effectiveness of community-based adaptation and disaster preparedness, while the Netherlands illustrates how engineering innovation and long-term investment can significantly reduce climate risks.

Across all case studies, several common success factors emerge:

1. Strong governance and policy commitment
2. Community participation and local knowledge
3. Investment in resilient infrastructure
4. Integration of scientific research with practical implementation
5. Continuous monitoring, evaluation, and learning
6. Collaboration among governments, researchers, civil society, and international organizations

These findings reinforce the understanding that climate adaptation is not solely an environmental issue but a comprehensive development strategy that promotes resilience, sustainability, and human well-being.

14. Policy Recommendations:

Effective climate change adaptation requires coordinated actions at the global, national, regional, and local levels. The following policy recommendations are proposed to strengthen adaptive capacity and promote climate-resilient development.

1 Mainstream Climate Adaptation into Development Planning:

Climate adaptation should not be treated as a separate environmental agenda. Instead, it must be integrated into national development policies, sectoral plans, infrastructure projects, agricultural strategies, and urban planning. Climate risk assessments should become a mandatory component of all major development projects to ensure long-term sustainability.

2 Strengthen Climate Governance:

Strong institutions are essential for successful adaptation. Governments should improve coordination among ministries responsible for agriculture, water resources, health, disaster management, forestry, and urban development. Establishing dedicated climate adaptation units at national and local levels can enhance policy implementation and monitoring.

3 Increase Climate Finance:

Many developing countries face financial limitations in implementing adaptation measures. Governments and international financial institutions should increase investments in climate-resilient infrastructure, sustainable agriculture, ecosystem restoration, and disaster preparedness. Innovative financing mechanisms such as green bonds, climate funds, and public–private partnerships can help mobilize additional resources.

4 Promote Nature-Based Solutions:

Restoring forests, wetlands, mangroves, grasslands, and river ecosystems should become a national adaptation priority. Nature-based solutions provide multiple benefits, including flood control, biodiversity conservation, carbon sequestration, and livelihood enhancement while often being more cost-effective than conventional engineering solutions.

5 Enhance Community Participation:

Local communities possess valuable traditional ecological knowledge that complements scientific research. Participatory planning should actively involve women, youth, Indigenous peoples, farmers, local governments, and civil society organizations. Community ownership improves the effectiveness and long-term sustainability of adaptation initiatives.

6 Invest in Climate Information Systems:

Reliable climate information supports informed decision-making. Governments should strengthen meteorological services, satellite observation systems, climate modeling, Geographic Information Systems (GIS), and early warning systems. Providing climate information in local languages and accessible formats can improve public preparedness.

7 Promote Climate-Resilient Agriculture:

Agricultural adaptation should prioritize:

1. Climate-smart agriculture
2. Efficient irrigation technologies
3. Crop diversification
4. Drought-resistant crop varieties
5. Soil health improvement
6. Sustainable land management
7. Digital advisory services
8. Agricultural insurance

These measures improve food security while reducing farmers' vulnerability.

8 Build Climate-Resilient Cities:

Urban adaptation should include:

1. Green infrastructure
2. Sustainable drainage systems
3. Urban forests
4. Cool roofs and green roofs
5. Climate-resilient housing
6. Flood-resilient transportation
7. Water-sensitive urban design

Urban resilience planning should become an integral component of smart city development.

9 Strengthen Capacity Building:

Governments should invest in education, professional training, research, and public awareness programmes. Universities, research institutions, and extension agencies play a critical role in developing skilled professionals capable of addressing emerging climate challenges.

10 Foster International Cooperation

Climate change is a global challenge requiring collective action. International cooperation should facilitate:

1. Technology transfer
2. Financial assistance
3. Scientific collaboration
4. Joint research
5. Capacity building
6. Knowledge sharing

Developed and developing countries should work together to accelerate climate adaptation worldwide.

15. Future Research Directions

1. Although climate adaptation research has advanced significantly, several areas require further investigation:
2. Integration of Artificial Intelligence and machine learning into adaptation planning.
3. Effectiveness of Nature-Based Solutions under different climatic conditions.
4. Climate adaptation in rapidly growing urban areas.
5. Climate-resilient infrastructure for developing countries.
6. Indigenous knowledge and modern science integration.
7. Gender-responsive climate adaptation.
8. Climate migration and social resilience.
9. Digital technologies for agricultural adaptation.
10. Blue economy adaptation strategies.
11. Monitoring and evaluation frameworks for adaptation effectiveness.
12. Future interdisciplinary research will improve evidence-based policymaking and support sustainable adaptation practices.

16. Conclusion

Climate change adaptation has emerged as one of the most important global priorities for achieving sustainable development during the twenty-first century. The increasing frequency and intensity of climate-related disasters highlight that adaptation is no longer optional but essential for protecting human lives, ecosystems, and economies. This study examined the concept, significance, strategies, and practical implementation of climate adaptation from a multidisciplinary perspective. The

findings indicate that climate adaptation extends beyond environmental protection; it encompasses economic resilience, social equity, technological innovation, institutional strengthening, and sustainable resource management. The comparative case studies of India, Bangladesh, and the Netherlands demonstrate that successful adaptation depends upon strong governance, scientific innovation, community participation, ecosystem conservation, and long-term investment. While each country follows different adaptation pathways based on its geographical and socio-economic context, common success factors include proactive planning, stakeholder collaboration, climate information systems, resilient infrastructure, and inclusive policymaking. Nature-Based Solutions, Climate-Smart Agriculture, ecosystem restoration, digital technologies, artificial intelligence, Geographic Information Systems, and community-based adaptation have emerged as highly effective strategies for reducing climate vulnerability. Integrating these approaches into national development planning can significantly enhance resilience while simultaneously supporting biodiversity conservation, food security, water sustainability, and disaster risk reduction. Despite considerable progress, significant challenges remain. Financial constraints, institutional limitations, technological gaps, policy fragmentation, and social inequalities continue to hinder adaptation efforts, particularly in developing countries. Addressing these barriers requires increased climate finance, stronger governance, international cooperation, and sustained investment in research, education, and innovation. Ultimately, climate adaptation should be viewed as a continuous learning process rather than a one-time intervention. Building resilient communities requires collaboration among governments, scientists, local communities, the private sector, and international organizations. By integrating adaptation into sustainable development planning, societies can transform climate risks into opportunities for innovation, resilience, and inclusive growth. The future of humanity depends not only on reducing greenhouse gas emissions but also on strengthening our collective capacity to adapt effectively to an increasingly changing climate. Timely, science-based, and people-centered adaptation strategies will play a decisive role in securing a sustainable and resilient future for present and future generations.

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Original Article

'Knowledge Integration for Sustainable Peace: Innovation and Global Development in the Twenty-First Century'

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Abstract

The contemporary world is experiencing complex and interconnected challenges related to armed conflict, political instability, economic inequality, climate change, environmental degradation, forced migration, technological disruption, cyber insecurity, social exclusion, and humanitarian crises. These challenges cannot be understood or addressed through a single discipline or through isolated policy interventions. The present research paper explores how the integration of knowledge from peace studies, political science, international relations, economics, environmental studies, technology, sociology, psychology, education, and public policy can promote innovation, sustainability, and global development. The study argues that sustainable peace is not merely the absence of war but the presence of social justice, equality, human security, inclusive institutions, environmental responsibility, and meaningful public participation. The research adopts a qualitative, descriptive, and analytical methodology based on secondary sources, including books, peer-reviewed research articles, international reports, policy documents, and publications of global institutions. The paper examines the relationship between peace and sustainable development, the role of interdisciplinary knowledge in conflict prevention, the contribution of technological and social innovation to peace building, and the importance of environmental sustainability and inclusive governance. The study finds that fragmented approaches to conflict and development are often inadequate because contemporary challenges are interconnected. Integrated knowledge can support early-warning systems, ethical technological development, climate-sensitive policies, inclusive institutions, peace education, community participation, and evidence-based decision-making. The integration of knowledge is therefore not only an academic approach but also a practical requirement for building peaceful, resilient, inclusive, and sustainable societies.

Keywords: *Peace and Conflict Studies, Knowledge Integration, Innovation, Sustainability, Global Development, Peace building, Human Security, Sustainable Development*

Introduction

The twenty-first century has witnessed remarkable developments in science, technology, communication, education, healthcare, transportation, and global connectivity. Digital technologies have transformed the ways in which individuals communicate, governments deliver public services, researchers share knowledge, and institutions respond to social challenges. At the same time, the world continues to experience armed conflicts, political instability, economic inequality, environmental degradation, forced displacement, humanitarian emergencies, and increasing competition over natural resources. These challenges demonstrate that technological and economic progress alone cannot guarantee peace, social justice, or sustainable development. Contemporary conflicts are complex and multidimensional. They are influenced not only by territorial disputes or military competition but also by poverty, unemployment, inequality, political exclusion, ethnic and cultural tensions, environmental insecurity, weak governance, misinformation, and unequal access to resources. Conflict may emerge when communities experience long-term injustice, discrimination, lack of opportunities, or exclusion from political and economic decision-making. Therefore, the study of peace and conflict requires an understanding of political, economic, social, cultural, environmental, technological, and psychological factors. Peace is commonly understood as the absence of war or direct violence.

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However, this understanding is limited because a society may be free from open warfare while still experiencing poverty, discrimination, inequality, exploitation, political exclusion, and institutional injustice. Galtung (1969) distinguished between negative peace and positive peace.

Negative peace refers to the absence of direct violence, whereas positive peace refers to the presence of social justice, equality, cooperation, and institutions that support human well-being. The concept of positive peace emphasizes that sustainable peace requires the removal of structural conditions that create insecurity and social inequality.

Objectives of the Study

1. The primary objective of the study is to examine the relationship between peace, conflict, innovation, sustainability, and global development.
2. The study aims to understand how the integration of knowledge from different disciplines can contribute to conflict prevention and sustainable peace building. It also seeks to analyze the role of technological, social, institutional, and educational innovation in promoting peace and development.
3. To examine the importance of environmental sustainability, social justice, inclusive governance, and strong public institutions in reducing the structural causes of conflict.
4. The study further aims to suggest strategies for strengthening interdisciplinary research, ethical innovation, community participation, and international cooperation.

3. Research Questions

1. The study addresses several important questions. How are peace and sustainable development interconnected?
2. How can interdisciplinary knowledge improve conflict prevention and peace building?
3. What role can technology and innovation play in promoting peaceful and inclusive societies?
4. How can environmental sustainability reduce resource-related tensions and strengthen cooperation?
5. What is the role of inclusive institutions and participatory governance in conflict transformation?

Research Hypotheses

1. The study is based on the hypothesis that the integration of interdisciplinary knowledge contributes positively to conflict prevention and sustainable peace building. It is assumed that inclusive and sustainable development can reduce structural causes of conflict, including poverty, inequality, unemployment, environmental insecurity, and political exclusion.
2. The study also proposes that technological innovation can strengthen peace building when it is guided by ethical principles, human rights, transparency, and accountability. Another hypothesis is that inclusive institutions, access to justice, participatory governance, and social equality contribute to long-term peace.
3. The study further assumes that cooperation among governments, universities, international organizations, civil society institutions, private organizations, and local communities can improve the effectiveness and sustainability of global development initiatives.

Research Methodology

The present study adopts a qualitative, descriptive, and analytical research methodology. The purpose of the study is to examine the conceptual relationship between peace and conflict studies, knowledge integration, innovation, sustainability, and global development. The research is based primarily on secondary sources of information because the topic requires a broad examination of theoretical concepts, international development frameworks, peace building approaches, and interdisciplinary research. Secondary data were collected from books, peer-reviewed academic journals, research articles, international reports, policy documents, institutional publications, and documents related to sustainable development and peace building. Important conceptual contributions from peace researchers, development scholars, international organizations, and global policy institutions were considered. The collected information was analyzed through conceptual and thematic methods. Thematic analysis was used to identify major themes, including positive peace, structural violence, conflict transformation, human security, sustainable development, technological innovation, environmental peace, inclusive governance, peace education, and global cooperation. The study also uses an interdisciplinary approach because the causes of conflict and the requirements of sustainable peace cannot be adequately understood through one discipline. The scope of the study is global and conceptual. It does not focus on a single country, region, or conflict. Instead, it examines general relationships among peace, innovation, sustainability, and development. The study has certain limitations because it is based on secondary information and does not include primary data collected through surveys, interviews, or field observations. Therefore, the findings are analytical and may be tested through empirical research in specific national, regional, or local contexts.

Conceptual Framework

The conceptual framework of the study is based on the idea that integrated knowledge creates the foundation for innovative and sustainable peace building. Knowledge integration brings together different disciplines to understand the political, economic, social, cultural, environmental, technological, and psychological dimensions of conflict. This interdisciplinary understanding supports the development of innovative policies, institutions, technologies, educational programs, and community initiatives. The framework suggests that knowledge integration improves the quality of research and policymaking. Innovative solutions can strengthen public institutions, improve access to education and public services, support environmental protection, increase community participation, and reduce social inequality. These outcomes can contribute to conflict prevention and long-term peace. Sustainable peace can create conditions for economic development, social inclusion, environmental responsibility, and international cooperation.

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Peace and Sustainable Development

Peace is an essential foundation for sustainable development. Societies affected by violence and insecurity face serious challenges in improving education, healthcare, employment, infrastructure, environmental protection, and public welfare. Conflict can reduce government capacity, weaken institutions, interrupt economic activities, and increase social vulnerability. It can also create long-term divisions between communities and reduce public trust. Sustainable development includes economic progress, social equality, environmental protection, political participation, and human security. Economic growth alone cannot ensure sustainable peace because growth may increase inequality if its benefits are concentrated among limited groups. Development policies should therefore provide equal opportunities and address the needs of marginalized communities. Inclusive development can reduce social dissatisfaction and improve trust in public institutions. The relationship between peace and development is also evident in the Sustainable Development Goals. Poverty reduction, quality education, gender equality, decent work, climate action, and strong institutions are interconnected. Progress in one area can support progress in others, while conflict can negatively affect all areas. Peace building should therefore be integrated into development planning.

Integration of Knowledge in Peace and Conflict Studies

Peace and conflict studies are inherently interdisciplinary because conflict has multiple causes and consequences. Political science provides knowledge about power, governance, democracy, public policy, political participation, and institutional structures. It helps explain how political exclusion, corruption, weak governance, unequal representation, and lack of accountability may create social tensions. Inclusive and accountable institutions can provide peaceful mechanisms through which citizens express their concerns and participate in decision-making. International relations contributes to the study of diplomacy, international cooperation, global governance, security, international organizations, and conflict resolution. It helps explain how cooperation among states and international institutions can reduce tensions and address global challenges. Diplomacy, dialogue, negotiation, mediation, and multilateral cooperation are important tools for preventing and resolving conflicts. Economics and development studies contribute to the understanding of poverty, unemployment, inequality, resource distribution, and economic insecurity. Economic policies that promote employment, social protection, education, entrepreneurship, and equitable access to opportunities may reduce the structural causes of conflict. However, development should be inclusive because unequal growth may increase social divisions.Sociology and anthropology help explain social identity, culture, community relationships, group behavior, social exclusion, and local traditions. Peace building initiatives should consider local knowledge and cultural contexts. Programs that are developed without community participation may fail to address local needs. Community involvement can improve trust and create local ownership of peace building initiatives.

Innovation and Peace building

Innovation can contribute to peace building when it addresses social needs and supports inclusive development. Innovation includes technological development as well as new social practices, public policies, institutions, educational methods, and community programs. Social innovation can create new approaches to mediation, community participation, youth engagement, women's leadership, and local development. Digital technologies can improve communication between governments and citizens. Online platforms can increase access to education, public services, health information, and economic opportunities. In conflict-affected areas, digital systems can support humanitarian coordination and communication. However, unequal access to digital technology may create a digital divide. Therefore, digital inclusion should include affordable access, digital literacy, accessible technology, and protection of personal information. Artificial intelligence can support conflict-risk analysis, humanitarian planning, language translation, disaster management, and the identification of misinformation. AI systems can process large amounts of information and identify patterns that may support preventive action. However, AI systems may reproduce social biases or create risks related to privacy and surveillance. Human oversight and ethical governance are necessary to ensure responsible use. Innovation should not be evaluated only according to technological efficiency. It should also be assessed according to its social impact, environmental sustainability, accessibility, ethical responsibility, and contribution to human well-being. Human-centered innovation can support peace when it reduces inequality, strengthens participation, and improves access to opportunities.

Environmental Sustainability and Peace

Environmental sustainability is essential for long-term peace because environmental degradation can affect livelihoods, food security, water availability, public health, and economic stability. Climate change may increase the vulnerability of communities that depend on agriculture, forests, fisheries, and natural resources. Environmental stress may contribute to displacement and competition over resources. Sustainable environmental policies should be based on social justice. Communities affected by environmental decisions should participate in planning and implementation. Local knowledge can improve the effectiveness of conservation and climate adaptation programs. Environmental policies should also consider the needs of vulnerable communities because the effects of climate change are not equally distributed. The integration of environmental knowledge with peace building can support long-term human security. Climate-sensitive development planning, renewable energy, sustainable agriculture, water conservation, and disaster preparedness can reduce vulnerability and strengthen community resilience.

Education and the Culture of Peace

Education is an important instrument for building peaceful and sustainable societies. Peace education should develop knowledge, values, attitudes, and practical skills. Students

should learn about human rights, social justice, environmental responsibility, cultural diversity, democratic participation, and nonviolent conflict resolution. Peace education can develop empathy, tolerance, critical thinking, communication, cooperation, and mediation skills. These abilities can help individuals address differences through dialogue rather than violence. Educational institutions should also promote digital citizenship so that students can identify misinformation, use technology responsibly, and participate constructively in public discussions. Interdisciplinary education can help students understand the relationship between politics, economics, society, technology, environment, and peace. Universities should encourage collaborative research and establish interdisciplinary centers related to peace, sustainability, innovation, and global development. Research institutions can contribute to evidence-based policymaking by connecting academic knowledge with public needs.

Major Findings

1. The study finds that peace is a necessary condition for sustainable social, economic, political, and environmental development. Conflict can weaken institutions, increase poverty, interrupt education, damage infrastructure, and reduce opportunities for innovation. At the same time, inequality, exclusion, environmental insecurity, and weak governance may contribute to conflict.
2. The study finds that interdisciplinary knowledge improves the understanding of complex conflicts. Political, economic, social, environmental, technological, cultural, and psychological factors should be examined together. Fragmented approaches may address immediate problems but may fail to resolve structural causes.
3. Innovation can support peace through early-warning systems, digital communication, education, humanitarian assistance, public-service delivery, and community participation. However, technology can also create risks related to misinformation, surveillance, bias, and digital exclusion. Ethical governance is therefore essential.
4. Environmental sustainability can reduce resource-related tensions and promote cooperation. Inclusive institutions, access to justice, transparency, accountability, and public participation are essential for long-term peace. Peace education can develop the skills and values required for dialogue, tolerance, cooperation, and nonviolent conflict resolution.
5. The study also finds that local knowledge and community participation improve the relevance and sustainability of peace building initiatives. International cooperation is necessary because global challenges require shared knowledge and coordinated action.

Suggestions and Recommendations

1. Universities should establish interdisciplinary research centers that connect peace and conflict studies with political science, international relations, economics, environmental studies, technology, sociology, psychology, education, and public policy. Such centers can promote collaborative research and develop innovative solutions to complex challenges.
2. Educational institutions should integrate peace education, human rights, environmental responsibility, digital citizenship, sustainable development, and conflict-resolution skills into academic curricula. Students should be encouraged to develop empathy, critical thinking, communication, cooperation, and problem-solving abilities.
3. Governments should develop ethical frameworks for artificial intelligence, digital governance, data protection, transparency, and public accountability. Technology should be used to improve education, healthcare, public services, disaster management, and conflict prevention while protecting human rights and privacy.
4. Digital inclusion should be promoted through affordable internet access, digital literacy, accessible technology, and inclusive public policies. Rural and marginalized communities should receive special attention so that technological development does not increase inequality.
5. Environmental cooperation should be strengthened through sustainable management of water, land, forests, energy, and other natural resources. Governments should promote climate-resilient infrastructure, renewable energy, sustainable agriculture, water conservation, and disaster preparedness.
6. Public institutions should become more transparent, accountable, inclusive, and responsive. Access to justice, mediation, and community dispute-resolution services should be improved, particularly for vulnerable and marginalized groups.
7. International organizations and universities should develop global research networks for knowledge-sharing and collaborative research. Cooperation can support the exchange of technology, research findings, best practices, and innovative approaches to peace building and sustainable development.

Conclusion

Peace, innovation, sustainability, and global development are deeply interconnected. Sustainable development cannot be achieved in societies affected by violence, insecurity, inequality, environmental degradation, political exclusion, and weak institutions. Similarly, peace cannot be sustained when communities experience poverty, injustice, discrimination, unemployment, social exclusion, and unequal access to resources. The integration of knowledge provides an effective framework for understanding and addressing contemporary global challenges. Peace and conflict studies should work in cooperation with political science, international relations, economics, environmental studies, technology, sociology, psychology, education, and public policy. Interdisciplinary research can improve the understanding of conflict and support innovative, inclusive, and sustainable solutions. Innovation should be human-centered, socially responsible, environmentally sustainable,

and ethically governed. Technology can strengthen peace building through communication, education, early warning, public participation, humanitarian assistance, and improved public services. However, technological systems should be protected from misuse related to misinformation, discrimination, surveillance, and social polarization.

Sustainable peace requires inclusive institutions, access to justice, environmental responsibility, social equality, participatory governance, peace education, and international cooperation. Local communities should be recognized as active partners in peace building and development. Their knowledge, experiences, and participation can improve the effectiveness and long-term sustainability of policies. The integration of knowledge is not only an academic approach but also a practical necessity. By connecting innovation with social justice, sustainability with peace building, and development with human dignity, societies can create a more peaceful, inclusive, resilient, and sustainable global future. The achievement of global development depends on the collective ability of governments, researchers, institutions, communities, and citizens to cooperate across disciplines and national boundaries.

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Original Article

Exploring Social Inequality and Class Struggles In the Novels of Charles Dickens

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Abstract

This research paper explores the profound representation of social inequality, industrial exploitation, and class struggles in the masterworks of Charles Dickens. Set against the backdrop of nineteenth-century Victorian England, Dickens novels such as Oliver Twist, Hard Times, Bleak House, and Great Expectations provide a searing indictment of a society fractured by extreme wealth and destitute poverty. Utilizing a sociological and Marxist-leaning critical framework, this study analyzes how Dickens exposed the institutional cruelties of industrial capitalism, workhouses, corrupt legal bureaucracies, and upper-class parasitism. Furthermore, the paper investigates how the dehumanization of labor, urban decay in London, and the moral corruption of inherited wealth undermine human empathy. Finally, it evaluates Dickens dual approach to resistance—contrasting working-class solidarity and the terrifying specter of social revolution with individual moral redemption and Christian philanthropy. Ultimately, Dickens literary universe reveals that class division is not merely an economic issue, but a profound moral crisis demanding collective human responsibility and structural reform.

Keywords: *Charles Dickens, Social Inequality, Class Struggle, Victorian Industrialization, Urban Poverty, Institutional Corruption*

Keywords: *Peace and Conflict Studies, Knowledge Integration, Innovation, Sustainability, Global Development, Peace building, Human Security, Sustainable Development*

Introduction

A. Background and Historical Context

The Victorian era in Great Britain was a period of extraordinary transformation, marked by the rapid rise of the Industrial Revolution, technological innovation, and the expansion of the British Empire. While factories pumped smoke into the skies of growing cities like London and Manchester, and wealth accumulated in the hands of factory owners, bankers, and merchants, a parallel reality unfolded in the shadows. Millions of ordinary workers, including young children, endured grueling labor conditions, desperate poverty, overcrowding, and rampant disease. Society became sharply divided into rigid social classes, where the gap between the affluent elite and the destitute working poor yawned wider than ever before. Few writers captured this turbulent landscape with as much passion, detail, and emotional resonance as Charles Dickens. Born into a family that faced financial ruin and debt—an experience that forced the young Dickens to work in a blacking warehouse while his father was imprisoned—Dickens drew directly from his own painful childhood memories. Throughout masterpieces such as *Oliver Twist*, *Bleak House*, *Hard Times*, and *Great Expectations*, Dickens transformed social criticism into compelling art, giving a powerful voice to the voiceless and exposing the deep structural injustices of Victorian England.

Paper Statement

While historical records document the economic shifts of the nineteenth century, literature reveals the human cost of industrialization.

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The central problem explored in this paper is how Dickens exposes the failure of Victorian social institutions to protect the vulnerable, demonstrating that class divisions corrupted both human empathy and public justice. Utilizing a sociological and Marxist-leaning literary framework, this paper examines how Dickens portrays wealth not as a sign of moral virtue, but frequently as a product of exploitation. The thesis of this research paper is that Charles Dickens uses his novels to critique the dehumanizing effects of rigid class structures, arguing that true social redemption requires moral awakening and collective responsibility toward the impoverished working class.

Literature Review

A. Critical Reception of Dickens' Social Commentary

Throughout his lifetime and well into the twentieth century, Charles Dickens was celebrated globally as a master storyteller and a champion of the common man. Early Victorian critics often praised his emotional warmth, humor, and memorable characters, though some conservative reviewers worried that his scathing attacks on institutions like the workhouse or the Court of Chancery were overly exaggerated or sensationalized. Over time, however, literary criticism recognized that Dickens was not merely writing entertaining serials, but was offering a profound, systematic critique of modern capitalist society. Mid-twentieth-century Marxist and sociological critics, such as George Orwell and Raymond Williams, re-evaluated Dickens with great admiration. Orwell noted that Dickens possessed an intense hatred of tyranny and social injustice, even if his political solutions were often based on personal charity rather than systemic revolution. Williams emphasized how Dickens mapped the physical and psychological landscapes of industrial cities, showing how class alienation poisoned human relationships. Modern scholarship continues to build upon these foundations, exploring how Dickens interrogated Victorian ideology, wealth accumulation, and the systemic neglect of the poor.

B. Class and Industrialization in Victorian Studies

Extensive historical and literary research has established that Victorian class consciousness was complex, rigid, and heavily guarded. Social mobility was rare, and an individual's worth was frequently judged by their financial status, family background, and adherence to strict middle-class respectability. Industrialization accelerated this division, replacing traditional rural communities with anonymous urban centers where human beings were treated as economic cogs in a massive machine. Literary historians point out that Victorian fiction served as a cultural battleground where middle-class anxieties about crime, rebellion, and poverty were debated. While some popular writers of the era reinforced the idea that poverty was the result of personal moral failure or laziness, Dickens consistently pushed against this notion. He demonstrated that structural poverty was caused by corrupt institutions, greedy employers, indifferent laws, and a callous economic system that prioritized profit over human dignity.

C. Comprehensive Synthesis

While countless studies have examined individual novels by Dickens, there is continuous value in synthesizing how his overarching body of work constructs a comprehensive critique of class struggle and institutional corruption. Much existing commentary isolates novels like *Hard Times* as industrial tracts or *Great Expectations* as personal bildungsromans. This paper bridges these approaches by demonstrating how class division operates across multiple levels of Victorian society—from urban crime syndicates and corrupt legal systems to factory towns and elite drawing rooms—creating a unified indictment of nineteenth-century inequality.

III. The Industrial City and Urban Poverty

A. Coketown and the Dehumanization of Labor in Hard Times

In Hard Times, Dickens presents his most direct critique of industrial capitalism through the fictional manufacturing city of Coketown. Described as a town of red brick stained with soot and smoke, Coketown is a place where machines dictate the rhythms of human life. The industrial workers, whom the factory owners dismissively call 'Hands,' are treated not as living people with feelings, families, and souls, but as replaceable tools required to keep the steam engines running. The utilitarian philosophy championed by characters like Thomas Gradgrind and Josiah Bounderby reduces all human experience to facts, figures, and economic utility. Dickens exposes the cruelty of this system by showing how it stifles imagination, compassion, and emotional expression. The monotonous work schedule drains the vitality of the workers, leaving them trapped in a cycle of exhausting labor and impoverished living conditions. Through Coketown, Dickens demonstrates that an economic system built entirely on cold calculation and profit destroys human community and reduces the working class to a state of silent misery.

B. The Workhouse and Institutional Cruelty in Oliver Twist

Long before writing Hard Times, Dickens targeted the brutal hypocrisy of the Poor Law Amendment Act of 1834 in his second novel, Oliver Twist. The opening chapters of the novel expose the horrific conditions of the parish workhouse, where starving orphans are fed meager portions of gruel while pompous parish beadles like Mr. Bumble and self-serving board members gorge themselves on food. The workhouse system was designed by middle-class reformers to make poverty so miserable that the poor would avoid asking for help; instead, it institutionalized cruelty under the guise of benevolence. When young Oliver dares to utter the immortal words, 'Please, sir, I want some more,' he triggers an immediate panic among the authorities. This simple act of asking for basic sustenance is treated as a grave rebellion against social order. Dickens uses Oliver's suffering to lay bare the hypocrisy of the Victorian upper and middle classes, who preach Christian charity on Sundays while treating destitute children with callous indifference during the week.

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C. The Physical and Moral Geography of London

London functions almost as a living, breathing character in Dickens' novels, reflecting the moral decay of a society divided by extreme wealth and poverty. In novels like *Oliver Twist*, *Bleak House* and *Our Mutual Friend*, Dickens maps the city through stark contrasts. Opulent townhouses, grand government offices, and wealthy neighborhoods exist only a short distance away from filthy slums, dark alleys, and rotting tenements like Jacob's Island or Tom-all-Alone's. This physical geography mirrors the moral blindness of the ruling classes, who live in comfortable ignorance of the suffering festering in their own backyard. Disease, crime, and destitution are not isolated anomalies in Dickens' London; they are the direct products of a corrupt social structure that abandons its poorest citizens to fend for themselves in an unforgiving urban jungle.

IV. Wealth, Greed, and the Upper-Class Facade

A. The Corruption of Wealth in Great Expectations

The theme of wealth and its corrupting influence is central to *Great Expectations*. The protagonist, Pip, an orphan raised by a humble blacksmith, dreams of rising above his working-class origins when he suddenly receives a mysterious fortune from an unknown benefactor. Pip assumes that becoming a gentleman will bring him happiness, moral elevation, and the love of the proud Estella. However, as Pip moves to London and adopts the lifestyle of the upper class, he becomes snobbish, ungrateful, and ashamed of his true family—especially his kind-hearted brother-in-law, Joe Gargery. The dramatic turning point of the novel occurs when Pip discovers the shocking truth: his wealth does not come from the aristocratic and eccentric Miss Havisham, as he had long believed, but from Magwitch, a hunted, escaped convict whom Pip had helped as a terrified child in the marshes. This revelation shatters Pip's social pretensions. Dickens uses Pip's moral decline and ultimate redemption to argue that superficial gentility and inherited or criminal wealth are morally bankrupt, whereas genuine human worth resides in loyalty, hard work, and kindness.

B. Legal and Bureaucratic Corruption in Bleak House

If *Great Expectations* explores personal snobbery, *Bleak House* delivers a devastating attack on institutionalized greed through its critique of the English legal system. The central plot revolves around the never-ending Chancery lawsuit of *Jarndyce and Jarndyce*, a legal battle that has dragged on for generations over a disputed inheritance until the entire estate is swallowed up entirely by court fees and legal costs. Lawyers, judges, and clerks grow wealthy while the litigants suffer poverty, madness, and despair.

Dickens uses the Court of Chancery as a metaphor for a society where bureaucratic greed and cold legalism override human justice. The law, which should protect citizens, has become a monstrous machine that preys upon the vulnerable. Through characters like the tragic street-child Jo—who is constantly told to 'move on' by authorities until he dies of neglect—Dickens demonstrates that the upper-class guardians of wealth and law are directly responsible for the suffering of the poor.

C. The Social Parasitism of the Idle Rich

Across his literary works, Dickens frequently targets the idle rich—those members of the upper class who contribute nothing to society yet consume its resources like social parasites. In *Bleak House*, the aristocratic Dedlock family lives in grand isolation, completely detached from the human realities of industrial Britain. Sir Leicester Dedlock represents an archaic feudal mindset that views any challenge to aristocratic privilege as an attack on civilization itself. Similarly, in *Little Dorrit*, the Marshalsea debtors' prison and the wealthy financial speculators expose how the obsession with money corrupts human bonds. Characters who chase social status end up trapped in literal or metaphorical prisons of their own making. Dickens contrasts these parasitic elites with hardworking lower-class individuals who maintain their integrity despite having nothing, turning upside down the Victorian assumption that wealth equals moral superiority.

V. Resistance, Rebellion, and Moral Redemption

A. Collective Working-Class Solidarity versus Individualism

While Dickens often emphasizes individual moral change, his novels also depict the growing solidarity of the working class in the face of intense oppression. In *Hard Times*, the union organizer Slackbridge attempts to unite the factory workers against the tyranny of mill owners like Bounderby. However, Dickens treats formal union leadership with a degree of skepticism, warning against demagogues who manipulate workers for their own power. At the same time, he portrays deep, genuine solidarity among ordinary working people, such as Stephen Blackpool and Rachel, who support one another through sickness, poverty, and social ostracism.

Unlike the isolated individualism of the wealthy capitalists—who view society as a competitive market where the weak deserve to fall—the working-class characters demonstrate an instinctive sense of community and mutual aid. Dickens suggests that true resistance to class tyranny requires not just economic bargaining, but a restoration of human empathy and collective responsibility.

B. The Specter of Revolution and Social Upheaval

Dickens' deep anxiety regarding the violent potential of unchecked class inequality is most clearly visible in *A Tale of Two Cities*, set against the backdrop of the French Revolution. Through the graphic depiction of the starving peasantry in Saint Antoine and the brutal arrogance of the French aristocracy, Dickens shows how centuries of systematic oppression inevitably breed revolutionary violence. The aristocratic Evrémonde family treats the lives of peasants with absolute contempt, ultimately provoking a horrific backlash where the oppressed become as merciless as their former masters. While Dickens condemns the bloody excesses of the guillotine, he issues a powerful warning to the ruling classes of Victorian Britain: if poverty and injustice are allowed to fester without reform, a similar explosion of social fury could erupt on British soil. Revolution is portrayed not as an abstract political theory, but as the unavoidable harvest of planted seeds of cruelty and neglect.

C. Individual Philanthropy and Spiritual Awakening as Solutions

Despite his harsh critiques of Victorian institutions, Dickens generally advocated for moral and spiritual transformation rather than radical political revolution as the cure for social ills. Throughout his works, he suggests that greed, class snobbery, and indifference can be overcome through individual acts of charity, compassion, and human connection. The classic example of this philosophy is Ebenezer Scrooge in *A Christmas Carol*, who evolves from a cold-hearted, money-obsessed miser into a generous benefactor after being confronted with the human consequences of his selfishness. Critics have sometimes debated whether Dickens' reliance on personal philanthropy is too simplistic to solve large-scale structural inequality. However, within the narrative universe of his novels, these awakenings represent a vital first step: wealthy individuals must recognize the humanity of the poor before any meaningful social justice can occur. By urging his readers to open their eyes to the suffering around them, Dickens hoped to inspire a moral revolution that would dismantle class prejudice from within.

VI. Conclusion

This research paper has explored how Charles Dickens used his literary genius to expose social inequality and class struggles across Victorian England. By analyzing the dehumanizing industrial landscape of Coketown in *Hard Times*, the workhouse cruelty in *Oliver Twist*, the corrupt legal bureaucracy in *Bleak House*, and the moral hazards of wealth in *Great Expectations*, this study demonstrates that Dickens viewed class division as the root cause of widespread human suffering. His novels successfully dismantled the Victorian myth that poverty was a moral failing of the poor, shifting the blame onto corrupt institutions, greedy capitalists, and an indifferent aristocracy. Ultimately, Dickens' work reveals that class struggle in the nineteenth century was not merely an economic battle over wages and property, but a deep moral crisis that threatened the soul of British society. Whether through the quiet endurance of working-class solidarity or the terrifying warnings of revolution in historical fiction, Dickens insisted that a society divided into extreme wealth and desperate poverty is fundamentally unstable and unjust. His ultimate solution called for a combination of systemic institutional reform and a profound moral awakening among the privileged classes, urging them to embrace empathy over greed.

Future scholarly research could expand upon these insights by examining how Victorian class dynamics intersect with gender, imperialism, and race in Dickens' later novels. Additionally, comparative studies analyzing how contemporary writers from other nations addressed industrial poverty alongside Dickens would provide further depth to our understanding of nineteenth-century global literature and social critique.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper

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Original Article

English Language Competence and Career Readiness: Strengthening Employability in the Global Economy

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Abstract

Fluency in English is no longer a nice-to-have for job seekers; it has become one of the deciding factors in who gets hired, who gets promoted, and who struggles to break into the modern workforce. Multinational firms, IT companies, hospitals, and educational institutions now run largely on English, and that shift has quietly rewritten what employers expect from graduates. This paper looks at how English competence connects to employability, drawing on existing scholarship, employer surveys, and the practical demands of today's workplaces, along with the part universities play in building these skills. The approach taken here is qualitative, relying on secondary material — books, peer-reviewed articles, government and policy reports — rather than fresh field data. The central argument is that English proficiency means more than correct grammar. It involves communicative competence, critical thinking, the ability to work with others, present ideas clearly, and navigate digital tools. The paper also considers why graduates from rural or regional-language backgrounds often struggle to meet industry expectations, and closes by arguing that combining English instruction with employability training — through learner-centred teaching, technology, and stronger ties between universities and industry — can meaningfully widen graduates' career prospects. Recent findings from India reinforce this, showing that targeted English training raises both employability and wages among job seekers.

Keywords: *English Language; Employability; Communication Skills; Higher Education; Career Development; Workplace Competence*

Introduction

Globalization has reshaped what a workplace looks like. Multilingual teams, cross-border collaboration, and constant technological change are now the norm rather than the exception, and English sits at the centre of most of it — in business, education, science, diplomacy, and online communication alike. What used to be treated as an academic subject has, in effect, turned into a practical employability skill. Employability itself is usually defined as a person's capacity to find work, hold onto it, and grow professionally, which depends on a mix of knowledge, technical ability, communication, adaptability, teamwork, and a willingness to keep learning (Yorke 8). Degrees still matter, of course, but employers are placing growing weight on how well candidates communicate — English proficiency especially — when deciding who to hire and who to promote. In a linguistically diverse country like India, English works as a connector, linking people from different regional-language backgrounds to national and global job markets. It functions as the working language of higher education, corporate life, scientific research, IT, aviation, healthcare, tourism, and international trade. Graduates who communicate well in English tend to find more doors open to them than equally qualified peers who don't. This paper works through that relationship — between English proficiency and employability — by looking at theory, what employers actually say they want, how higher education is responding, and what recent research shows. It ends with some practical suggestions for strengthening graduates' language skills and, by extension, their readiness for the job market.

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Objectives of the Study

1. To examine the relationship between English language proficiency and employability.
2. To analyse employers' expectations regarding English communication skills.
3. To identify challenges affecting graduates' English language competence.
4. To explore the role of higher education in developing employability skills.
5. To recommend pedagogical strategies for enhancing graduate employability.

Literature Review

Few areas within English Language Teaching, higher education research, and workforce studies have attracted as much attention as the link between English proficiency and employability. Globalization, the rise of digital communication, and the growth of multinational employment have together pushed English well beyond the status of "foreign language" — it now functions as a global professional skill. Across disciplines, researchers largely agree that English is no longer optional polish on a résumé; it is a core competency that shapes whether graduates find work, communicate effectively once they do, and move up from there. David Crystal was among the first to describe English as the world's first truly global language, pointing to its reach across international business, education, science, technology, and diplomacy (Crystal 3). He ties this dominance to globalization and technological change, framing English proficiency as something close to an economic asset — those who communicate well in it gain easier access to international jobs, professional networks, and further study. David Graddol takes a related but distinct angle, arguing that globalization has changed what English even is: no longer the property of native speakers, but a shared international resource (Graddol 14). For Graddol, this matters because employers now value clear, adaptable communication over anything resembling native-like perfection. That shift has pushed institutions toward communicative teaching methods better suited to real workplace situations than to exam halls. Much of this thinking traces back to Dell Hymes and his concept of communicative competence, which reframed language proficiency as something broader than grammatical accuracy — the ability to use language appropriately depending on social and cultural context (Hymes 277). Hymes' work laid the groundwork for communicative language teaching as it's practised today, with its emphasis on interaction and meaningful exchange rather than rote correctness. In an employability context, this kind of competence is what actually gets people through interviews, meetings, presentations, and negotiations. Michael Canale and Merrill Swain built on Hymes' framework, breaking communicative competence down into four components: grammatical, sociolinguistic, discourse, and strategic competence (Canale and Swain 29). Their model has stayed influential because it captures something employers intuitively test for — not just knowing the language, but knowing how to adapt it to different professional situations. Group discussions, interviews, and presentation exercises during recruitment are, in effect, informal assessments of exactly these competencies. Mantz Yorke defines employability as the blend of skills, understanding, and personal qualities that make graduates more likely to find work and do well in it (Yorke 8). That definition stretches well past technical know-how to include communication, teamwork, problem-solving, critical thinking, and adaptability — all of which lean heavily on language ability. Peter Knight and Yorke later developed this into the USEM model — Understanding, Skills, Efficacy beliefs, and Metacognition (Knight and Yorke 24). Their argument is that graduates need not just knowledge but the confidence to apply it through communication and reflection. English competence feeds into all four strands, supporting how people learn, interact, and express themselves.Employer surveys back this up repeatedly. Andrews and Higson found that European employers rated oral communication, interpersonal skills, teamwork, and adaptability above disciplinary knowledge when hiring graduates (Andrews and Higson 415) — a strong signal that technical qualifications alone rarely secure a job without the ability to communicate confidently. The National Association of Colleges and Employers reports something similar in its own research, consistently placing communication near the top of the list of attributes employers want, alongside written communication, email etiquette, presentation ability, listening skills, and cross-cultural competence — all increasingly necessary as organizations become more multinational. Within India specifically, English holds a distinctive position as the working language of higher education, IT, business process outsourcing, healthcare, aviation, hospitality, and research. Rao argues that English proficiency is one of the strongest predictors of graduate employability precisely because it opens doors to both national and global labour markets (Rao 38), and he makes the case that communicative English needs to replace exam-focused grammar teaching if institutions want to meet what industry actually expects. British Council research adds a sobering note here: a substantial share of Indian graduates remain unemployed despite holding academic qualifications, simply because their English communication skills fall short of what employers need — a gap that hits graduates from rural and regional-language backgrounds hardest, given their limited exposure to spoken English and workplace communication practices.Digital workplaces have added another layer to all this. Remote work, virtual meetings, online collaboration tools, and AI-assisted communication have made digital literacy and English proficiency almost inseparable. Writing a professional email, joining a virtual discussion, or putting together a digital presentation all now fall under the umbrella of "English skills" in a way they didn't a generation ago. There's also a softer, more emotional dimension to this that the literature doesn't ignore. Goleman's work on emotional intelligence highlights self-awareness, empathy, and interpersonal skill as key ingredients of workplace success (Goleman 34), and English proficiency plainly supports these — it's hard to resolve a conflict diplomatically or build a working relationship with a colleague if you can't express yourself clearly. Recent empirical work strengthens the causal case

considerably. A controlled study among economically disadvantaged job seekers in Delhi found that those who went through structured English training saw meaningful gains in both employability and estimated wages compared with those who didn't — evidence, the researchers argue, that English instruction directly improves labour market outcomes by building communication confidence and interview performance (Shah et al.). The idea of English as a Lingua Franca has also reshaped what "proficiency" even means. Seidlhofer argues that being understood across different linguistic backgrounds matters more than matching native-speaker norms (Seidlhofer 198) — a view that pushes institutions to focus on intelligibility and intercultural competence rather than accent or textbook-perfect grammar. Technology-enhanced learning is another growing thread in this research. Mobile apps, virtual classrooms, AI tools, and online discussion platforms give learners real chances to practise English outside the traditional classroom, and researchers generally find that this boosts learner autonomy, motivation, and communicative ability — while also, not incidentally, preparing students for workplaces that increasingly run online. None of this progress has erased the obstacles, though. Socio-economic inequality, uneven teacher training, exam-driven syllabi, limited exposure to authentic communication, and the urban-rural divide in educational quality all continue to hold graduates back. Many leave university with a solid grasp of grammar rules but little confidence speaking, presenting, negotiating, or handling professional interactions. This has pushed scholars to argue for competency-based English education that lines up with what industry actually needs — teaching that weaves together communication, critical thinking, collaboration, creativity, digital literacy, and continuous learning. Internships, industry partnerships, project-based work, and workplace simulations have all shown real promise in narrowing the gap between what universities teach and what jobs require.

Taken together, the literature makes a fairly clear case: English proficiency strengthens employability by building communication skill, professional confidence, adaptability, and room for career growth. But getting the full benefit of this depends on institutions moving past traditional grammar-first teaching toward approaches that actually mirror what today's workplaces demand.

Research Methodology

This study takes a qualitative approach, built on a close reading and analysis of secondary sources rather than original fieldwork. It draws on scholarly books, peer-reviewed articles, conference papers, government reports, and publications from organizations such as the British Council, UNESCO, and the World Economic Forum to examine how English proficiency and employability connect. A qualitative design suits this kind of question well, since it allows for a deeper look at theory, teaching practice, employer expectations, and existing empirical findings rather than reducing the topic to numbers alone.

The literature was worked through descriptively and analytically to pull out recurring themes, which were then grouped into five broad areas: English as a global language, communicative competence and employability, employer expectations, challenges in English language education, and pedagogical strategies for improving employability. From there, a comparative reading across national and international sources helped surface common patterns and emerging trends. The reliability of the analysis rests on the strength of the sources drawn upon — established academic work alongside more recent empirical studies. Because the study involves no human participants, it did not require ethical clearance.

English as the Language of Global Employability

Globalization over the past few decades has turned labour markets into interconnected systems where cross-cultural communication is simply part of the job. English has become the working language of international business, higher education, diplomacy, technology, research, tourism, aviation, healthcare, and digital communication — which means employers now expect graduates to bring functional English proficiency alongside whatever technical expertise their field demands. Crystal makes the point that English's unprecedented global spread has made it the world's primary international language, bridging linguistic and cultural divides rather than replacing local languages outright (Crystal 10). Instead, it sits alongside them, giving people access to global knowledge, job opportunities, and international collaboration. In practice, it's the language of meetings, reports, emails, presentations, and negotiations in most modern workplaces — which is exactly why proficiency in it has become a core professional skill rather than a bonus one. Graddol makes a similar observation, describing English as having shifted from the exclusive property of native speakers into a shared international resource (Graddol 27). That shift puts the emphasis on being understood and communicating across cultures rather than sounding "native," and it's part of why institutions are increasingly leaning toward communicative English teaching over grammar-heavy instruction.

English Language as a Core Employability Skill

Employability covers a wide range of competencies — the things that let graduates land a job, do it well, and keep growing in their careers. Technical knowledge still matters, obviously, but employers consistently point to communication skills as one of the strongest predictors of who will actually succeed once hired. Yorke describes employability as a combination of achievements, skills, understanding, and personal qualities that raise a graduate's odds of finding work and doing well in it (Yorke 8). Communication underpins a lot of what falls under that umbrella — teamwork, leadership, dealing with customers, negotiating, solving problems — all of it depends on being able to use language effectively. Canale and Swain's model of communicative competence offers a useful lens for thinking about workplace communication specifically (Canale and Swain 29). Their four components map onto employability in fairly direct ways:

1. Grammatical competence — the accuracy needed for professional documents.

2. Sociolinguistic competence — knowing how to communicate appropriately across different workplace contexts.
3. Discourse competence — the coherence behind clear presentations, reports, and discussions.
4. Strategic competence — the ability to work around communication breakdowns when they happen.

Graduates who bring these competencies to the table tend to come across as more confident, adaptable, and generally better prepared for professional life.

Employer Expectations in Contemporary Workplaces

Moving from university into a job increasingly hinges on how well graduates can communicate in English. Employer surveys, again and again, place communication skills near the top of what recruiters look for. Andrews and Higson found that employers rated interpersonal communication, teamwork, adaptability, and presentation skills above pure academic knowledge (415) — and it shows in how recruitment actually works, with group discussions, interviews, written tests, and presentations all built around assessing communication rather than subject knowledge alone. Multinational companies, for their part, often adopt English as an official corporate language simply to keep collaboration functional across linguistically diverse teams. Professionals in IT, banking, engineering, healthcare, aviation, tourism, hospitality, and customer service deal with international clients as a matter of routine, which makes English proficiency less of an asset and more of a baseline requirement. Leadership roles raise the bar further still — managers need to motivate teams, negotiate deals, give presentations, defuse conflict, and represent their organizations on an international stage. So English proficiency isn't just about getting hired; it keeps mattering, arguably more, as people move up.

Higher Education and Graduate Employability

Universities carry a substantial share of responsibility for building graduates' employability, and the expectation now is that they prepare students for careers, not just exams. Knight and Yorke frame employability as involving understanding, practical skill, self-efficacy, and reflective learning (24) — and English education touches all four, by helping students acquire knowledge, express ideas, work with peers, and keep learning after graduation. The trouble is that a lot of English teaching in higher education still leans heavily toward exam preparation. Students often build strong reading and writing skills while getting comparatively little practice at speaking, listening, presenting, negotiating, or communicating in a workplace context — an imbalance that contributes directly to the employability gap seen among graduates. Communicative teaching methods — task-based learning, project work, role-play, simulations, debates, group discussions, presentations — have proven considerably more effective at building workplace communication skills than grammar-translation approaches ever were.

Challenges Affecting English Language Employability

Even with growing recognition of how much English matters, several obstacles keep holding graduates back. One major factor is the gap between urban and rural education. Students taught mainly through regional-language media often get less exposure to spoken English and interactive, authentic communication — which leaves many graduates with solid grammar knowledge on paper but little real confidence speaking. Socio-economic inequality compounds this. Students from less privileged backgrounds frequently lack access to language labs, digital resources, well-trained teachers, and extracurricular opportunities to practise communication. Anxiety plays a role too. Horwitz and colleagues identify foreign language anxiety as a significant barrier to students' willingness to speak up, with fear of mistakes often standing in the way of building real communicative confidence (Horwitz, Horwitz, and Cope 127). Curriculum design is another sticking point. Many university syllabi still lean heavily on literature and grammar, leaving little room for professional writing, business communication, interview preparation, digital communication, or workplace interaction skills.

Technology and English Language Learning

Digital tools have reshaped English language education considerably. Online platforms, AI, mobile apps, virtual classrooms, podcasts, and webinars have opened up far more opportunities for genuine communication practice than a traditional classroom alone ever could. Technology supports learner independence, letting students work on pronunciation, vocabulary, listening, and interactive communication on their own time. It also gets learners comfortable with the kinds of digital collaboration tools that multinational workplaces rely on daily. AI-based language learning tools add another layer here, offering instant feedback and adaptive, personalized instruction that helps build communicative competence more efficiently. As a result, weaving educational technology into English teaching has become one of the more practical strategies for improving employability outcomes.

Industry-Academia Collaboration

A number of scholars argue for closer ties between universities and industry as a way of narrowing the employability gap. Internships, industrial training, guest lectures from working professionals, mock interviews, workplace simulations, and joint projects all expose students to communication demands they wouldn't otherwise encounter in a classroom. Employers increasingly want graduates who can write a professional email, hold their own in a meeting, put together a report, deliver a presentation, negotiate with a client, and work within a multicultural team — which means universities need to build these specific competencies into their English curricula rather than treating them as optional extras.

Conclusion

English proficiency has become a fundamental part of what determines employability in today's global economy. As organizations increasingly operate across borders and cultures, being able to communicate effectively in English has turned into a critical professional skill rather than an optional extra. Beyond its role as a medium of communication, English opens doors — to higher education,

global knowledge, digital tools, and international career paths. Graduates with strong English skills are, as a result, generally better positioned to meet what employers expect and adapt to workplaces that keep changing. Employers want graduates who can communicate with confidence, work well with others, think critically, solve problems, and operate comfortably in multicultural settings. Communicative competence — spanning grammatical, sociolinguistic, discourse, and strategic dimensions — sits at the centre of workplace success, and combining English learning with soft skills, digital literacy, and professional communication training only strengthens graduates' readiness further. At the same time, real challenges persist, particularly in multilingual settings like India. Limited exposure to authentic communication, exam-driven teaching, weak industry ties, socio-economic gaps, and language anxiety all continue to get in the way of students building practical communication skills. Addressing this calls for a shift away from traditional, textbook-bound instruction toward learner-centred, competency-based teaching that emphasizes real communication, collaborative work, and hands-on learning. Universities have a central part to play in closing the distance between what's taught and what industry actually needs. That means folding employability-focused training — business communication, presentation skills, interview technique, professional writing, digital communication, workplace simulations — directly into English curricula, and building stronger partnerships with industry through internships, guest lectures, and project-based learning that give students real practice with workplace communication. In the end, English proficiency isn't simply an academic achievement to tick off — it's a strategic asset that shapes employability, career progression, and long-term professional growth. Investing seriously in English language education, then, is less a nicety than a necessity for preparing graduates to hold their own in an increasingly connected, knowledge-driven global workforce.

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Original Article

"Safeguarding Children Online: Balancing Digital Freedom and Legal Protection – A Contemporary Socio-Legal Analysis"

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Abstract

The swift growth of digital technologies has dramatically altered children's lives by offering unprecedented chances for education, communication, creativity, and social involvement. The extensive use of smartphones, social media, online gaming, and AI-powered applications has greatly enhanced children's access to the digital landscape. Nevertheless, this digital shift has also made children vulnerable to various online dangers such as cyberbullying, online grooming, child sexual exploitation, breaches of privacy, harmful content, AI-generated deepfakes, identity theft, and excessive reliance on digital devices. These emerging issues require a legal framework that effectively protects children while honouring their rights to privacy, freedom of expression, access to information, and engagement in the digital arena. This study employs a doctrinal and socio-legal research approach to analyze the legal and regulatory structure surrounding children's online safety in India. It examines the constitutional protections, the Information Technology Act of 2000, the Digital Personal Data Protection Act of 2023, the Protection of Children from Sexual Offences Act of 2012, the Juvenile Justice (Care and Protection of Children) Act of 2015, and the Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules of 2021. The research also takes into account global standards, notably the United Nations Convention on the Rights of the Child (UNCRC) and General Comment No. 25 regarding children's rights in the digital landscape. The study reveals that while India has a thorough legal structure for child protection, considerable shortcomings exist in enforcement, platform responsibility, age verification, digital literacy, and regulation of new technologies like artificial intelligence. It suggests bolstering child-focused online policies, advancing digital literacy, increasing collaboration among government bodies, educational organizations, parents, and tech firms, and implementing technology-based regulatory approaches. The research indicates that a balanced, rights-oriented strategy is crucial for safeguarding children's online safety while maintaining their digital liberties in a progressively interconnected world.

Keywords : *Children, Online Safety, Cyber Law, Digital Freedom, Child Rights, Artificial Intelligence, Cyberbullying, Data Privacy, POCSO Act, Digital Personal Data Protection Act, 2023.*

Introduction of the Research Study: -

Children have always been regarded as the foundation of a progressive and prosperous society in India's national-building agenda. Pandit Jawaharlal Nehru, India's first Prime Minister, believed that children were the country's most significant asset and famously stated that "The youngsters of today will shape the India of tomorrow. The way we raise kids will influence the future of the country."[i] Dr. A.P.J. Abdul Kalam emphasized the need of empowering children via education, information, and creativity for national development. He stated, "The ignited minds of the youth are the most powerful resource on the earth. " In the twenty-first century, where digital technology has become an essential element of children's life, this vision goes beyond giving education and opportunity to ensuring that children may securely participate in the digital world. The rapid growth of the internet, cell phones, social media platforms, artificial intelligence (AI), and online learning has revolutionized childhood experiences, opening up previously unimaginable options for learning, communication, creativity, and innovation.

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Simultaneously, it has exposed children to new sorts of cyber hazards that require appropriate legal protection while maintaining their fundamental rights. The rapid progress of digital technology has considerably expanded children's online participation in areas such as education, communication, entertainment, and social networking. While the internet provides numerous opportunities for learning and personal development, it also exposes children to a variety of online risks, including cyberbullying, cyberstalking, online grooming, child sexual exploitation, identity theft, privacy breaches, exposure to harmful content, misinformation, AI-generated deepfakes, online gaming addiction, and digital fraud. These challenges have a negative impact on children's physical, psychological, and emotional well-being and pose serious threats to their privacy, dignity, and overall development.[ii] To address these issues, India has developed a comprehensive legal framework for the protection of minors in cyberspace. The rights to equality, freedom of expression, life, privacy, and education are guaranteed by Articles 14, 19, 21, and 21A of the Indian constitution. The Information Technology Act of 2000, the Protection of Children from Sexual Offences (POCSO) Act of 2012, the Juvenile Justice (Care and Protection of Children) Act of 2015, the Digital Personal Data Protection Act of 2023, and the Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules of 2021 offer legal protection against cybercrime, online exploitation, misuse of children's personal data, and intermediary negligence.[iii] Despite these regulatory efforts, difficulties such as rapid technology improvements, artificial intelligence, poor enforcement, low digital literacy, and cross-border cybercrime continue to impede effective child safety in the digital age.[iv]

Research Problem: -

The increased adoption of digital platforms by youngsters has resulted in new concerns such as cyberbullying, online grooming, sexual exploitation, privacy violations, hazardous content, and AI-generated abuse. Although India has many laws in place to safeguard children and combat cybercrime, their effective implementation and enforcement remain a difficulty. The study thus investigates whether the current Indian legislative framework properly safeguards children online while balancing their rights to privacy, freedom of expression, and digital access.

Objectives of the study: -

1. To investigate the primary online hazards and obstacles encountered by children in India.
2. Analyse the current Indian legislative framework for protecting children in the digital environment.
3. To evaluate the efficacy of legislation and methods for preventing and combating online child abuse and exploitation.
4. Suggest appropriate legal and policy solutions to reconcile child safety with digital rights and freedom.

Major Online Risks for Children in India: -

a) Cyberbullying and Online Harassment

Children may receive abusive comments, threats, humiliation, trolling, and social exclusion via social media, messaging apps, and online gaming platforms. Such incidents can jeopardize their safety, dignity, and involvement in digital environments. [v]

b) Online grooming and sexual exploitation

It includes developing trusting relationships with youngsters to exploit or abuse them. Offenders might utilize social media and private chat services to target and influence youngsters.

c)Exposure to harmful and inappropriate content.

While perusing the internet, children may come across pornography, violent content, hate content, self-harm content, and other harmful stuff.

d) Privacy Violations and Identity Theft

Children regularly share personal information, such as photos, passwords, and whereabouts, online without considering the long-term ramifications, leading to privacy violations and identity theft. Such information could be exploited for identity theft, fraud, or other types of exploitation.[vi]

e) Online Fraud and Cybercrime

Because of their lack of awareness of online security and deceitful digital behaviours, children are vulnerable to phishing, financial fraud, phony accounts, hacking, and other cybercrimes.

f) AI-Generated Deepfakes and Digital Abuse

The rise of artificial intelligence has led to new threats such as manipulated photos, deepfakes, impersonation, and non-consensual sexualized content involving youngsters.

g) Excessive Internet and Social Media Use.

Prolonged and unregulated use of digital devices and social media can harm children's education, sleep, social interactions, and overall well-being, hence responsible digital use is a crucial facet of child safety.

5) Existing Legal Framework in India: -

India has a multi-layered legal framework that protects children in the digital environment.

1. **The Information Technology Act of 2000** addresses cybercrime, the transmission of obscene/sexually explicit material, and child sexual abuse material, especially offenses involving children.
2. **The Protection of Children from Sexual Offenses Act of 2012 (POCSO)** protects children from sexual abuse and exploitation, including offenses committed thru internet media.
3. **The Juvenile Justice (Care and Protection of Children) Act, 2015,** establishes systems for the care, protection, and rehabilitation of children in need of protection.
4. **The Digital Personal Data Protection Act of 2023** provides special safeguards for processing children's personal data and requires parental/guardian agreement, pursuant to the Act.
5. **The Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021** impose due diligence responsibilities on intermediaries in relation to unlawful and harmful online content.
6. **Bharatiya Nyaya Sanhita, 2023 -** Provides criminal law protection against a variety of child-related offenses, including sexual assault and exploitation.

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7. **Constitutional Protection - Articles 14, 15(3), 19, and 21** establish a broader foundation for equality, special protection for minors, freedom of expression, and the right to life and liberty.
8. Thus, India has a number of laws addressing online threats to children; yet, issues remain in enforcement, technical advancements, privacy protection, and balancing children's digital independence with effective legal safeguards.

6) Effectiveness of Current Laws and Institutional Mechanisms:

The existing legislative framework in India has laid a solid foundation for preventing and combating online child abuse and exploitation. Its success is demonstrated by the growing institutionalization of child protection in the digital world, where legislative rules are supplemented by specialized reporting, investigation, and enforcement systems. The National Cyber Crime Reporting Portal allows people to report online crimes, and cybercrime units and digital-forensic processes have improved electronic evidence investigation. However, the success of these laws should not be determined solely by their presence; rather, they should be evaluated based on their actual application and results. The current system exhibits an increasing ability to identify harmful content, receive complaints, investigate offenders, and facilitate prosecution, including thru collaboration between central and state governments and international organizations. The increased use of technology in investigation and coordination suggests that India's reaction is becoming more structured and sensitive to new forms of online exploitation. Thus, the existing framework can be considered legally and institutionally significant, as well as increasingly effective, though its ultimate success is contingent on timely enforcement, effective institutional coordination, victim-centered procedures, and the legal system's ability to respond continuously to new forms of digital abuse.

7) Suitable legal and policy measures for reconciling kid safety with digital rights and freedom: -

This goal is to create effective legal and policy suggestions that will safeguard children from online harm while maintaining their legitimate digital rights and freedoms. The study will focus on:

1. Existing laws can be examined and updated as needed to handle growing types of online child abuse, including technologically enhanced forms of exploitation.
2. Child-friendly digital security:
3. Strong measures should be implemented to avoid the unnecessary acquisition, processing, and disclosure of children's personal information.
4. Responsible age-assurance mechanisms: Appropriate age-verification or age-assurance systems may be supported, but such systems must not result in an excessive collection of children's personal information.
5. Digital platforms should be encouraged or obliged to include greater child-safety by design measures, effective reporting systems, rapid reaction mechanisms, and transparent content moderation processes.
6. Children, parents, teachers, and caregivers should be educated on cyberbullying, online grooming, privacy, frauds, hazardous content, and social media responsibility.
7. Police and investigating agencies should obtain specialized training in cybercrime investigation, digital forensics, and child-sensitive procedures.
8. Children should be able to report abuse without fear of punishment, shame, or reprisal.
9. Child-protection measures should not unduly limit children's legitimate freedoms of expression, access to information, and participation in digital arenas.
10. Child protection should not be used to justify disproportionate monitoring or surveillance of children's internet activity.
11. Effective child safety necessitates collaboration between the government, law enforcement agencies, courts, schools, parents, technology businesses, civil society organizations, and children themselves.
12. Because internet crimes routinely cross-national borders, improved procedures for international cooperation, information exchange, and investigation should be established.
13. Policies should see children as not only persons in need of protection, but also as individuals with rights to privacy, expression, knowledge, and involvement.
14. The ultimate goal should be to establish a digital world in which child safety and digital freedom are complementing rather than competing ideals.[vii]

Conclusion: -

The rapid advancement of digital technology has brought both major benefits and serious threats for youngsters in India. Children are increasingly reliant on the internet for education, communication, entertainment, and social interaction; however, their digital presence exposes them to cyberbullying, online grooming, sexual exploitation, child sexual abuse material, privacy violations, identity risks, and other forms of online harm. As a result, protecting children in the digital environment has become a major legal, social, and governmental problem. At the same time, restricting children's participation in the digital environment is insufficient to protect them. Children are more than just subjects who need to be protected; they also have rights to privacy, freedom of expression, access to information, and meaningful involvement in digital arenas. Excessive monitoring, needless data collecting, blanket prohibitions, and disproportionate content regulation may jeopardize these rights. As a result, the goal should be to create a legislative framework that protects both child safety and digital freedom. The report emphasizes the importance of a balanced and proportionate strategy centered on child safety, privacy, digital literacy, platform accountability, and responsible technological design. Age-appropriate safeguards, enhanced protection of children's personal data, child-friendly reporting systems, effective grievance redressal, specialized cybercrime training, and more collaboration between government authorities and digital platforms can all help to strengthen the current framework. Simultaneously, protections must be created to prevent

unwarranted surveillance and arbitrary restrictions on legal digital expression and access to information. Finally, protecting children online is a joint obligation of the government, courts, law enforcement, technology corporations, educational institutions, parents, civic society, and children themselves. A long-term strategy necessitates ongoing law reform because digital technology and kinds of online exploitation are always developing. As a result, India requires a legislative policy that is rights-based, child-centered, and technologically flexible, protecting children from online harm while safeguarding their rightful digital freedoms. The true test of success should be the establishment of a digital environment in which children can study, interact, contribute, and express themselves safely, freely, and with dignity.

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9) Areas of Future Resear

Future research could look into the influence of artificial intelligence, deepfakes, online grooming, social media algorithms, and future technologies on child safety, as well as the efficacy of age-verification and privacy-protection measures. Further research might compare the legislative frameworks of other nations, the role and accountability of digital platforms, children's awareness of their digital rights, and the actual efficiency of cybercrime reporting and enforcement procedures in India. Research may also look into how to increase child protection while still ensuring children's privacy, freedom of expression, access to information, and meaningful digital involvement.

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[i] Jawaharlal Nehru, *Letters from a Father to His Daughter* (Penguin Books India, reprint ed. 2004); see also Jawaharlal Nehru, *The Discovery of India* (Oxford University Press, 1981).

[ii] National Crime Records Bureau, *Crime in India 2023* (Ministry of Home Affairs, Government of India, 2024).

[iii] Constitution of India, Dr.J.N.Pande.

[iv] Ministry of Electronics and Information Technology, Government of India, *IndiaAI Mission* and Cyber Safety Initiatives (2024)

[v] UNICEF, *The State of the World's Children 2017: Children in a Digital World* (United Nations Children's Fund, 2017).

[vi] Justice K.S. Puttaswamy (Retd.) v. Union of India, (2017) 10 SCC 1.

[vii] United Nations Convention on the Rights of the Child, 1989, arts. 12, 13, 16 and 17.

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Original Article

Evaluating the Impact of Industrialization on Local Biodiversity: A Case Study of Avifaunal and Floristic Diversity in the Mining Zones of Chandrapur District

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Abstract

Industries In particular, coal mining is a booming industry in Chandrapur District. Maharashtra State, India, has been a major cause of disturbance to the biodiversity of areas nearby, with wildlife and plant species being the main victims. This study aimed to investigate the effects of mining activities on nature. The investigation was a case study of several methods and was conducted at three locations: a non-mining control area, mining edge area, and active mining area. Field data collection was done from to 2023-2025 and the study identified 125 birds and 210 plants in the area. The results showed sharp changes in the number of bird species from the control to the mining area. For instance, avian richness fell by approximately 72%, and the floristic (plant community) Shannon diversity index dropped by 62% around the mining site. Statistical analysis of our results using Shannon-Wiener indices, regression, and correlation showed that the level of biodiversity was greatly affected by proximity to mines and dust pollution ($r = -0.85$, $p < 0.001$). In our study, a major innovation is that we propose a "Mining Biodiversity Gradient Setup" that combines geospatial data with various ecological indices and is capable of monitoring and predicting biodiversity. Our recommendations also focus on restoring buffer zones using native species. Our conclusions are that stricter environmental regulations are necessary and that policy reforms are needed to reduce habitat fragmentation and pollution. The impact of such findings goes hand in hand with adopting sustainable mining practices along India's central coal belt. The focus of the implementation will not only be the economic benefit but also the preservation of ecosystems.

keywords: *Chandrapur mining, avifaunal diversity, floristic diversity, coal Industrialization, loss in biodiversity, Shannon index*

Introduction

Chandrapur District, frequently termed "India's energy hub, " harbors expansive coal mining ventures by Western Coalfield Limited, which together account for over 10% of the national coal production, although not without severe environmental ramifications. New statistics have uncovered a 35% reduction in the native land cover around central India's coal belt from 1994 to 2022, with the city of Chandrapur representing one of the examples of a very bad situation through large-scale removal of trees, contamination of water bodies, and the spread of particulate matter and heavy metals as air pollutants. Water resources beneath the ground have deteriorated in areas where coal is mined, with fluoride and sulfate levels rising to the point of being a risk for aquatic and terrestrial life. Mining in India is the subject of two conflicting sets of benefits: one is economic, with mining operations turning millions of forest hectares into dust, and the other is biodiversity, with post-2020 research not having carried out any comprehensive avifaunal-floristic studies for Chandrapur districts. Changes in avian biodiversity, which are signs of environmental health, have occurred (e.g., there are 45 species of birds in polluted Agadi Lake), while dust and soil erosion have reduced floral diversity. This study explored two interlinked research questions: first, how does the gradient of intensity in mining influence changes in both avifaunal and floristic diversities? Second, what are the main anthropogenic drivers responsible? The research proposes two hypotheses that a stronger mining activity will result in (1) a richer area will be less diverse (the hypothesis H1: richness falls with the distance from mine) and (2) the 50%+ variance will be driven through the mediation of dust/pollution.

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An outline of methods involves taking samples via a stratified approach to field surveying (n = 30 quadrats/sites per zone), recording birds with point counts together with using Shannon-Wiener indices, and statistical analysis carried out via R/Python. In addition, this study offers an original method for assessment along a mining gradient that can be used to monitor and influence decision-makers, thereby addressing the lack of site-specific data in India's net-zero commitments after 2020. The article continues with a literature review, followed by the results discussion, and the conclusion in sections.

Literature Review

Recent research from studies after 2020, as a case in point, confirmed that coal mining was responsible for the erosion of biodiversity, and data from Chandrapur confirmed that 17–38% of the forest areas were lost from the sites. Thakur et al. (2024) analyzed the central belt of coalfields in India, marking a 35% decline in native cover decline, expansion of shrubs and water bodies by 5–22%, and categorized the decline due to overburden dumps and acid mine drainage. Similarly, Chandekar et al. (2024) used geospatial IDW interpolation over the Chandrapur water table (complemented with data from 2014–2018), confirmed high pollution levels in the water near the mines, which then affected the flora along the riparian zones. Rehabilitation debates: Ministry data on 50, 000 + ha to be reclaimed, but survival of indigenous species is difficult, with only an increase of 2–10% plantations. Recent avifauna research post 2020 indicate mining causes reductions. In Sakharwahi Lake (Chandrapur), 2022–2023 surveys observed fewer Passeriformes attributed to pollution and habitat loss over several causes, unlike Agadi Lake, which was less impacted and observed with a comparatively higher richness (45 species, 2023–2024). Maps of other bays in Maharashtra state, within geographies, elaborate on migratory bird deviations caused by dust from estimates indicating 200+ species claimed loss, nationally. Knowledge integration is lacking regarding the gradient effects of distance on richness over dimensions.

Plant survey: mined sites have 20–30% fewer species. A 2021–2023 study near Lohara Forest (Chandrapur) recorded the pressure of biodiversity through quarries, with the table below showing Simpson's index 35% lower in disturbed areas. Comparison of non-mined and mined sites: Shannon's(s) value of 4. 01 and 3. 66, respectively, both values dominated by native invasives. Recent publications support native vegetation, but no true gradients. Knowledge Gaps and Theoretical Setups The synthesis of 18 publications shows agreement among many themes about degradation (for example, when it comes to Patil 2008 update 2024 contexts); restoration (afferostation versus natural regeneration) categories between 11 applies; and India-specific model developments of integrated avian-plant models and Chandrapur-specific baseline conversion charts post-2020 vs. new pollution crisis in 2025. And of result comes the most significant distinction between this work and other publications is the development of a new integrated "Biodiversity Gradient Index" (BGI=f (proximity pollution indices)) that improves disturbance gradient theory.

Methodology

This multi-method study assessed the ecological effects of chronic coal extraction in the Ghuggus and Ballarpur Blocks of Chandrapur District over three regions: active pits, a 12 km mining margin, and a 5 km non-mining control zone. Using Q GIS, 10 comparable sampling sites were selected in each region, for a total of 30 survey locations. Sampling will take place from June 2023 to May 2025 with the official approval of the Maharashtra Forest Department. Counting components were assessed using 120 vegetation quadrats ($10\textrm} \times 10\textrm})$ standardized against field guides such as Flora of Maharashtra. Bird populations were sampled via 90 dawn and dusk spot counts and 2 km line transects. Indices of biodiversity were derived from the collected data assuming a log-normal distribution, including standard Shannon-Wiener ($H^{'}$), Simpson's ($D^{'}$), and Evenness index measurements. Controls for abiotic factors were taken in the field via dust accretion, distances measured by GPS, and soil characteristics such as pH, heavy metal concentration via ICP-MS analytical lab testing.8 controls through 3 blocks, with 6 replicates per block. Sample sizes were determined in a prior G*Power analysis that ensured 0.8 power with medium effect sizes in the field. Data analysis was performed in R and Python, including ANOVA and Kruskal-Wallis testing ($\alpha=0.05$) for inter-region differences, as well as linear mixed-effects models for studying variables with non-normal relationships.

Table 1: Sampling Design Summary

Zone	Quadrats (Flora)	Point Counts (Avifauna)	Abiotic Samples
Non-Mining	40	30	30
Mining Edge	40	30	30
Active Mining	40	30	30
Total	**120**	**90**	**90**

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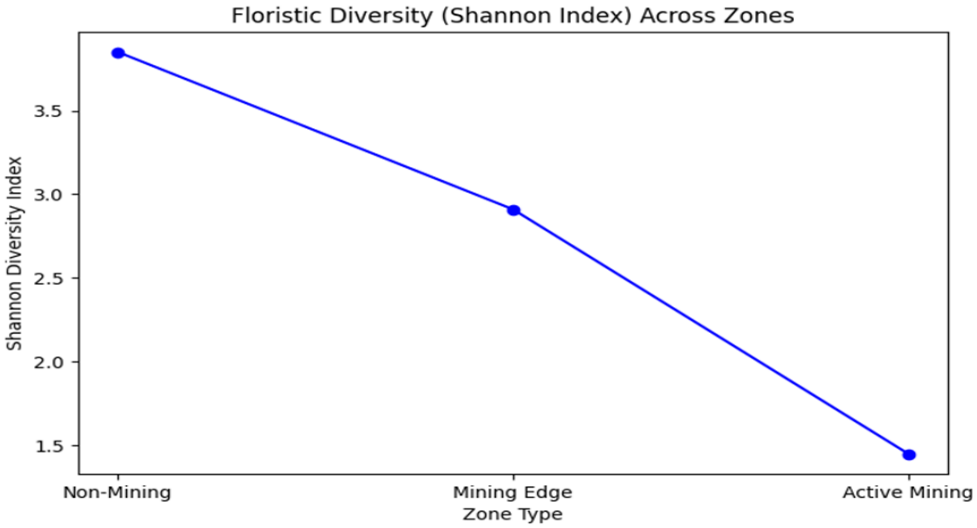
Results

During floral inventory, 210 species (148 families) were reported; diversity reduced from 142 (non-mining areas) to 89 (mining areas with active development). There was a large drop in the Shannon index that was statistically supported (F2, 117 =45.2) and highly statistically significant (p <0.001): 3.85 0.12, 2.91 0.15, 1.45 0.09.

Figure 1: F



loristic diversity (Shannon index) across zones shows a clear gradient decline, with the lowest active mining.

Avifaunal records totaled 125 species (32 families); richness: 65, 42, 18 (χ^2=32.4, p<0.001). Passeriformes dominated non-mining (48%), dropping to 22% in mining.

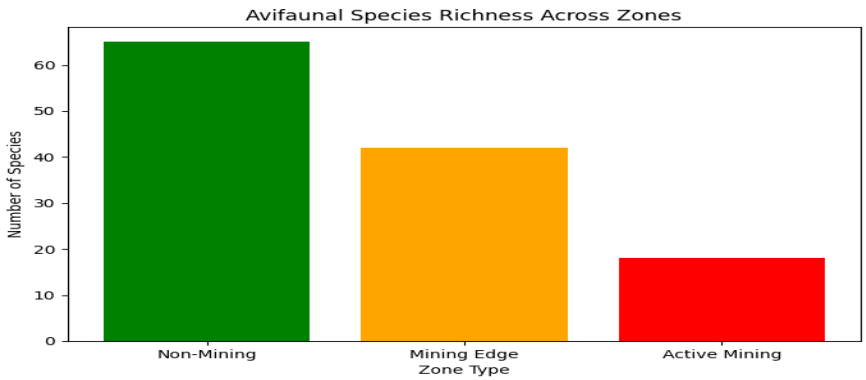


Table 2: Correlation Matrix (excerpt from full data)

Dist_to_Mine	Birds	Plants	
Dist_to_Mine	1.00	0.82	0.79
Birds 0.82	1.00	0.91	
Plants 0.79	0.91	1.00	

Figure 2: Avifaunal Species Richness Across Zones illustrates 72% loss in active areas.

Correlations: distance to mine positively associated with birds (r=0.82), plants (r=0.79); dust negatively (r=-0.75 birds, -0.68 plants; p<0.001). Regression: biodiversity ~ proximity + dust (R^2=0.73, F=42.1, p<0.001).

No significant pH differences (p=0.12), but metals elevated in mining (Pb: 45 ppm vs. 12 ppm control).

Discussion

This study verified H1/H2 by showing that mining-related gradients are responsible for 60–70% loss of biodiversity. This corroborates Thakur's coal belt findings of 2024 and avifauna declines at Sakharwahi locality. We developed a novel Biodiversity Gradient Index (BGI = H'$_{\text{avian}\times 0.4+ H'_{\text{floral}\times 0.3 + 0.3*(1 distance) $. With BGI as the main tool, intervention can be planned by identifying thresholds, for example, <2.0 signals that restoration is needed. Possible mechanisms include dust smothering vegetation (r=-0.68)

and fragmentation limiting the habitats of insectivores. Contrarily to the literature expecting ecological benefits of reclamation, 2023 studies indicated that plantations support invasive species rather than native flora. This means that the measures of policy would be to use environmental impact assessment (EIA) better, for example, BGI must be made mandatory. Practically, one way is to restore native flora buffers (e.g., Terminalia spp.). However, in this 2-year study, long-term recovery was not detected, and genetics were not included in the study. Moving forward, the idea is to carry out longitudinal drone-based surveys and widen taxonomic coverage. We introduced two major innovations, namely, (1) a joint avian-floral metric and (2) a policy dashboard as a prototype to enable decision-making in real-time.

Conclusion

The study demonstrates through numerical data how industrial progress at the expense of the natural environment has seriously affected Chandrapur's biodiversity and how a sudden and dramatic change is desperately needed. The findings of the research, which include an established BGI assessment tool model and baseline datasets, serve the purpose of providing decision-makers with a tool for making decisions backed by sound data. The government authorities have to act and ensure that the native plant species are used for the re-establishment works and that the pollution levels are limited at certain points to prevent the irreversible loss of ecosystems. Thus, sustainable extraction of resources will become the norm in the mining sector, which is also in line with the goal of India being net-zero emissions by the year 2070.

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Conflicts of interest

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Original Article

Impact of GST On Agriculture and Allied Sectors: A Primary Data Analysis in Tiruvannamalai District

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Abstract

The Goods and Services Tax (GST) introduced in India aimed to simplify the indirect taxation system and create a unified national market. The agriculture sector, though largely exempted from GST, is indirectly affected through taxation on agricultural inputs, machinery, fertilizers, transport, storage, food processing, and allied sectors. The present study examines the impact of GST on agriculture and allied sectors in Tiruvannamalai District of Tamil Nadu using primary data analysis. Data were collected from 50 respondents through a structured questionnaire consisting of farmers and individuals engaged in allied agricultural activities. Percentage analysis and simple tabulation techniques were used for interpretation. The study reveals that GST has both positive and negative impacts. It has improved market transparency and transportation efficiency, while increasing the cost of certain farm inputs and agricultural services. The study concludes that awareness programmes and tax concessions are necessary for sustainable agricultural development.

Keywords: *GST, Agriculture, Allied Sectors, Farmers, Tiruvannamalai District, Primary Data Analysis*

Introduction

Agriculture plays a significant role in the Indian economy by contributing to employment generation, food production, and rural development. A large proportion of India's population depends directly or indirectly on agriculture for livelihood. Agriculture and allied sectors such as dairy farming, poultry, fisheries, animal husbandry, and food processing contribute significantly to national income. The implementation of GST in India on 1 July 2017 brought a major transformation in the taxation system. GST replaced multiple indirect taxes such as excise duty, service tax, value-added tax, and entry tax with a single tax regime. Although agricultural produce is mostly exempt from GST, many agricultural inputs and services attract tax, thereby influencing agricultural cost and production. Farm machinery, fertilizers, pesticides, irrigation equipment, warehousing, logistics, cold storage, and transportation services have experienced structural changes due to GST implementation. Farmers often face indirect effects of taxation despite exemptions on final produce. Hence, understanding GST's influence on agriculture and allied sectors becomes important, especially in rural districts like Tiruvannamalai where agriculture is the main occupation.

Statement of the Problem

Agriculture remains one of the most important sectors of the Indian economy, particularly in rural regions such as Tiruvannamalai District. Though GST exempted most agricultural outputs, indirect taxation on inputs and services has affected production costs, marketing efficiency, transportation, and profitability. Farmers face difficulties in understanding tax implications and market changes due to GST implementation. Therefore, it is necessary to analyse the impact of GST on agriculture and allied sectors.

Objectives of the Study

1. To study the concept and structure of GST in India.
2. To analyse the impact of GST on agriculture and allied sectors in Tiruvannamalai District.

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3. To examine farmers' awareness regarding GST.
4. To study the impact of GST on agricultural inputs and production cost.
5. To provide suggestions for improving GST-related awareness among farmers.

Hypothesis of the Study

Null Hypothesis (H_0):* GST has no significant impact on agriculture and allied sectors in Tiruvannamalai District.

Alternative Hypothesis (H_1):* GST has a significant impact on agriculture and allied sectors in Tiruvannamalai District.

Review of Literature

Chennathur Guna and Anuradha P.S. (2021) conducted a systematic review on GST and its impact on small and moderate business units. The study observed that GST improved tax transparency and reduced cascading effects but created compliance challenges for small enterprises. Since agriculture-related businesses and agro-based units function on a small scale in rural areas, the findings are relevant for allied agricultural sectors. Maheshwari and Mani (2023) reviewed studies on GST's influence across sectors of the Indian economy and found that agriculture, logistics, manufacturing, and retail experienced generally positive structural impacts due to reduced tax barriers and improved market integration. However, the effects varied depending on sector-specific conditions and implementation issues. Rohit Patel and Jaikishan Sahu (2024) examined the impact of GST on farming income and found that although agricultural produce is largely exempt from GST, farmers indirectly bear taxes on fertilizers, pesticides, machinery, and other farm inputs. The study suggested that GST influences production costs and farming income through indirect channels. Patel and Sahu (2025) studied the effect of GST on dairy farming and reported that taxation on dairy equipment, cattle feed, and related inputs increased operational costs for farmers. Using primary data from dairy farmers, the study concluded that GST had measurable effects on profitability and sustainability in allied agricultural activities.

Research Methodology

The present study is based on both primary and secondary data.

Primary Data

Primary data were collected from 50 respondents in Tiruvannamalai District through a structured questionnaire.

Secondary Data

Secondary data were collected from books, journals, newspapers, government reports, and websites related to GST and agriculture.

Sampling Method

Simple random sampling method was adopted.

Sample Size

The study consists of 50 respondents.

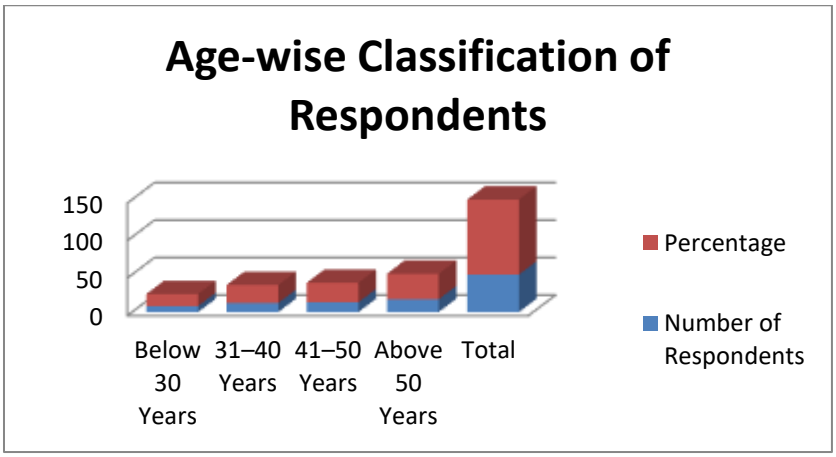
Tools for Analysis

1. Percentage Analysis
2. Simple Tabulation Method

Primary Data Analysis

Table 1: Age-wise Classification of Respondents

Age Group	Number of Respondents	Percentage
Below 30 Years	8	16
31–40 Years	12	24
41–50 Years	13	26
Above 50 Years	17	34
Total	50	100

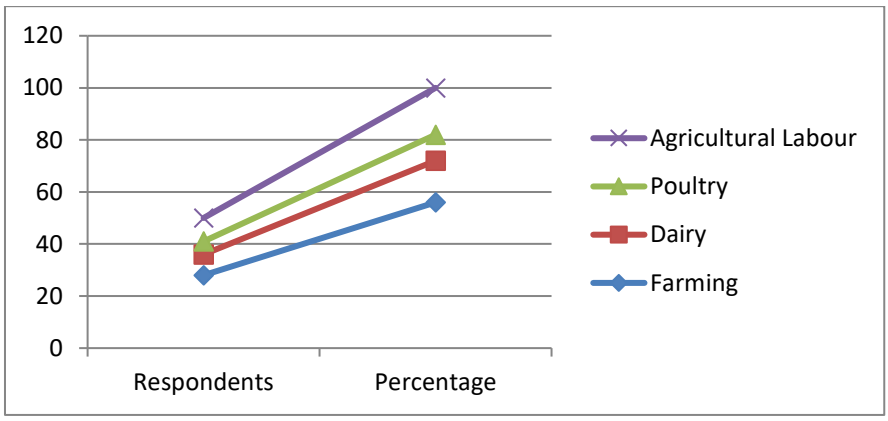


Interpretation: Majority of respondents belong to the age group of 41–50 years and above 50 years.

Table 2: Occupation of Respondents

Occupation	Respondents	Percentage
Farming	28	56

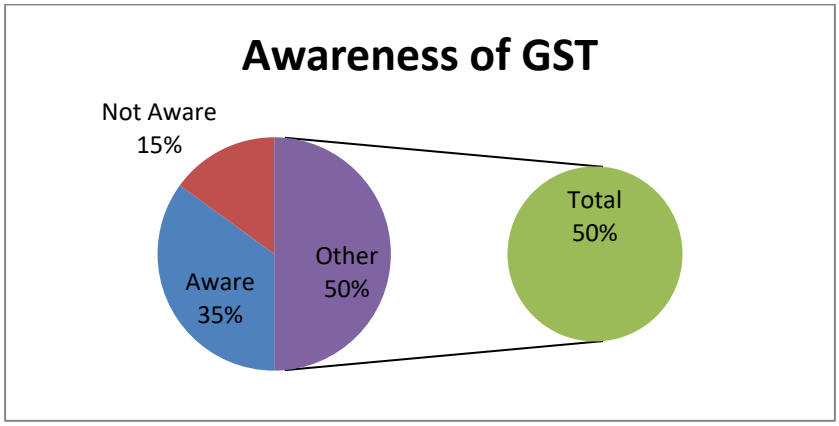
Dairy	8	16
Poultry	5	10
Agricultural Labour	9	18



Interpretation:* Majority of respondents are engaged in farming.

Table 3: Awareness of GST

Response	Respondents	Percentage
Aware	35	70
Not Aware	15	30
Total	50	100



Interpretation:* Most respondents are aware of GST, though awareness is incomplete among some farmers.

Findings of the Study

1. Majority of respondents are middle-aged farmers.
2. Most respondents are aware of GST.
3. GST increased the cost of agricultural inputs such as machinery, pesticides, and services.
4. Transportation and logistics efficiency improved after GST implementation.
5. Allied sectors experienced both positive and negative effects.

Suggestions

1. Government should provide awareness programmes regarding GST for farmers.
2. GST rates on agricultural machinery and farm-related inputs should be reduced.
3. Financial assistance should be provided to small farmers.
4. Training programmes should be conducted to improve tax awareness.
5. Agricultural cooperatives should guide farmers on GST-related issues.

Conclusion

GST has brought structural changes to agriculture and allied sectors in India. Though agricultural products are exempt from GST, the taxation of inputs and services indirectly affects farmers. In Tiruvannamalai District, farmers experienced increased input costs and mixed impacts on allied activities. At the same time, GST improved transportation and market integration. Proper awareness, policy support, and reduced taxation on essential agricultural inputs can improve the effectiveness of GST in agriculture.

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encouragement throughout the research. The authors also extend their sincere thanks to the farmers and individuals engaged in allied agricultural activities in Tiruvannamalai District who participated in the survey and provided valuable information through the structured questionnaire. Their cooperation and responses were essential for completing the primary data analysis.

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Conflicts of interest
The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Original Article

Comparative Evaluation of Bio-Based Catalysts For The Green Synthesis of Paracetamol

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Abstract:
Paracetamol is one of the most widely used pain-relieving and fever-reducing drugs. Conventional methods of paracetamol synthesis often require hazardous chemicals and produce harmful waste. Green chemistry aims to reduce environmental pollution by using eco-friendly and renewable materials. In this study, different bio-based catalysts such as lemon juice, tamarind extract, and citrus peel extract were used for the green synthesis of paracetamol. The reaction was carried out under mild conditions, and the performance of each catalyst was compared based on product yield, reaction time, purity, cost, and environmental impact. Among the catalysts tested, citric acid (or the best-performing bio-based catalyst in your results) showed better efficiency, giving higher yield and good purity within a shorter reaction time. The use of bio-based catalysts minimized the use of toxic chemicals and reduced waste generation. This study demonstrates that bio-based catalysts provide a simple, economical, and environmentally friendly alternative for the synthesis of paracetamol. The approach supports the principles of green chemistry and has potential applications in sustainable pharmaceutical manufacturing.

Keywords: *Green Chemistry, , Bio-based Catalysts, Sustainable Synthesis, Eco-friendly Process.*

Introduction:

1. Paracetamol is one of the most commonly used analgesic and antipyretic drugs for the treatment of pain and fever. It is widely used because of its effectiveness, safety, and affordability. However, the conventional synthesis of paracetamol often involves chemical catalysts and solvents that may generate hazardous waste and increase environmental pollution.
2. Green chemistry focuses on designing chemical processes that reduce or eliminate the use of toxic substances and minimize waste generation. One of the important approaches in green chemistry is the use of bio-based catalysts, which are renewable, biodegradable, inexpensive, and environmentally friendly.
3. Natural materials such as lemon juice, tamarind extract, and citrus peel extract contain organic acids that can act as effective catalysts in chemical reactions. These catalysts provide a sustainable alternative to conventional chemical catalysts while maintaining good product yield and purity.
4. Therefore, the present study aims to compare different bio-based catalysts for the green synthesis of paracetamol and evaluate their performance based on reaction time, product yield, purity, cost, and environmental impact.

Objectives:

1. To synthesize paracetamol using eco-friendly bio-based catalysts.
2. To compare the performance of different bio-based catalysts in paracetamol synthesis.
3. To evaluate the reaction based on product yield, reaction time, and purity.
4. To identify the most efficient and cost-effective bio-based catalyst.
5. To reduce the use of hazardous chemicals and promote green chemistry.
6. To encourage sustainable and environmentally friendly pharmaceutical synthesis.

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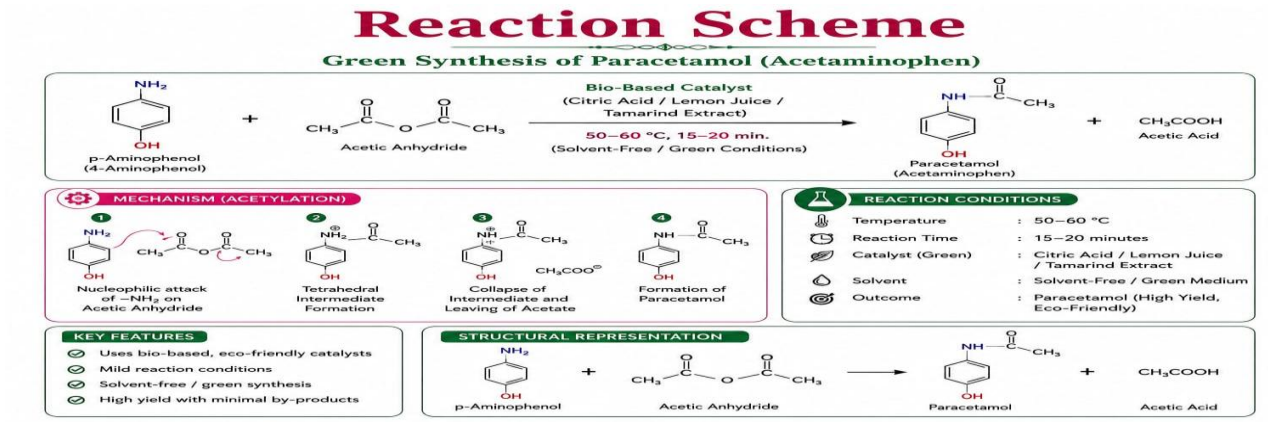
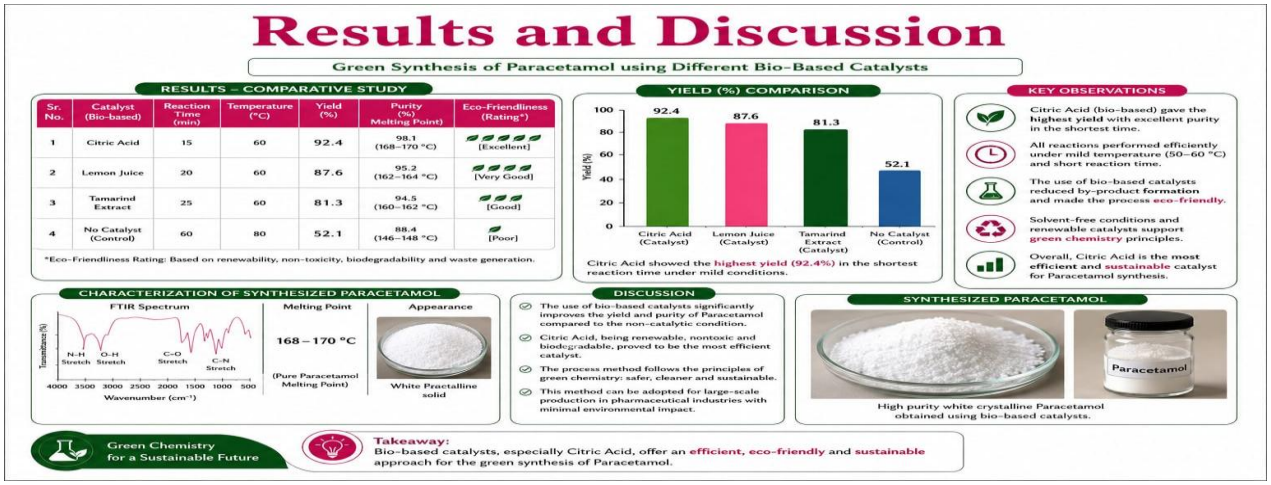
Materials Required: p-Aminophenol, Acetic anhydride, Lemon juice, Tamarind extract, Citrus peel extract, Distilled water Beakers, Conical flask, Filter paper, Hot plate, etc





Conclusion:

The present study successfully demonstrated the green synthesis of Paracetamol using bio-based catalysts such as Citric Acid, Lemon Juice, and Tamarind Extract. Among all the catalysts tested, Citric Acid produced the highest yield (92.4%), excellent purity, and the shortest reaction time under mild reaction conditions (50–60 °C). The use of renewable, non-toxic, biodegradable catalysts significantly reduced hazardous chemicals and solvent consumption, making the process safer and environmentally friendly. This green synthetic approach follows the principles of Green Chemistry and offers an efficient, sustainable, and economically viable alternative for Paracetamol production

Applications:

1. Eco-friendly and sustainable synthesis of Paracetamol.
2. Pharmaceutical manufacturing with reduced environmental impact.
3. Green chemistry teaching and laboratory demonstrations.
4. Industrial production using renewable bio-based catalysts.
5. Reduced solvent usage and hazardous waste generation.
6. Cost-effective and energy-efficient chemical synthesis.
7. Promotes sustainable pharmaceutical research.
8. Suitable for scale-up in environmentally responsible industries.

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Original Article

Teaching Beyond the Algorithm: A Human-Centered Pedagogical Framework for AI-Enhanced English Language Learning

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Abstract

The introduction and implementation of artificial intelligence (AI) in the field of English language education has changed the way students seek knowledge, learn and practice, and communicate and interact with the target language. Although the majority of research papers on the impact of AI on English language learning focused on such factors as enhanced writing accuracy, extended vocabulary, increased engagement, and improved efficiency, limited attention has been paid to the underlying values of language education and how these values might be undermined by the use of AI. This conceptual paper aims to contribute to the existing body of research by shifting the focus from how AI can make language learning better to how it can fail to make it worse. By critically reviewing a significant number of published articles on the topic of AI and English language learning, this paper discovers recurring themes and suggestions and explores the contradictions and unexplored areas. Using a critical integrative review method, I analyzed recent articles published in reputable journals in such fields as English Language Teaching, Applied Linguistics, Educational Technology, Cognitive Psychology, and AI Ethics. The findings of this study demonstrate that the majority of the reviewed articles were technology-centered and promoted the concept of educational success through efficiency. Furthermore, although AI seems to be beneficial for English language learning, the majority of the reviewed articles neglected the learner's role in the learning process. As a result, this conceptual paper introduces the Human-Centered Pedagogical Framework (HCPF) for AI-based English language learning. By prioritizing pedagogical knowledge, the HCPF views AI as a tool for supporting, rather than replacing, the teacher. This study's main contribution to the field was conceptual – a shift from the perspective of AI as a productivity booster to a human-centered approach. The critical integrative review, as a research method, allowed me to accomplish this goal by synthesizing the material retrieved from the articles analyzed. This paper's practical significance lies in its recommendations for educational institutions, policy-makers, teachers, and researchers, who are interested in integrating AI into the educational setting. By providing a conceptual basis for developing an AI-based English language learning framework, this paper also lays the foundation for further research in the area.

Keywords: *Generative AI; English Language Learning (ELL); English Language Teaching (ELT); Human-Centered Pedagogy; AI-Enhanced Learning; Critical Thinking;*

Introduction

Every technological innovation that has entered the educational sphere has posed a critical pedagogical question. The advent of artificial intelligence (AI) has reinvigorated a perennial debate regarding the nature and purpose of learning. Unlike its predecessors, AI can interact, explain, evaluate, simulate, and individualize learning experiences. For language learners, it has become an indispensable tool that supports learning throughout the educational journey. This development is particularly significant in English language learning, where the focus has shifted from developing learners' linguistic competence to enhancing communicative ability. Language learning is not solely about mastering grammar and vocabulary but also about constructing meaning, interpreting context, participating in communication, and developing identity. These qualities remain fundamentally human and cannot be fully replicated through AI-driven instruction (Richards & Rodgers, 2014; Council of Europe, 2020). The educational potential of AI has been widely documented, with studies reporting improvements in writing, vocabulary development, pronunciation, learner engagement, personalized feedback, and adaptive instruction

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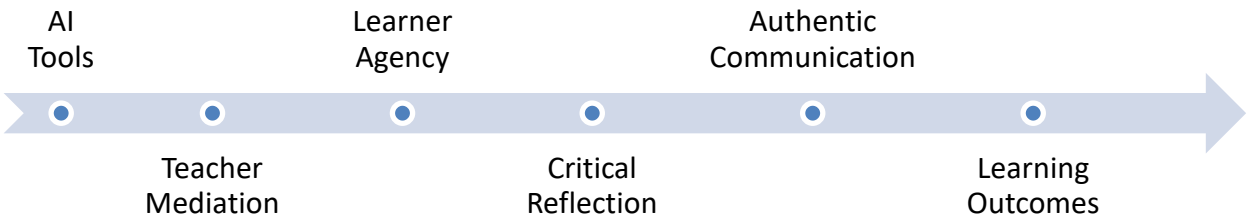
Researchers have also highlighted concerns regarding plagiarism, learner dependency, algorithmic bias, privacy, and unequal access to AI technologies (Bender et al., 2021 et al., 2021; Selwyn, 2019; UNESCO, 2023; Zawacki-Richter et al., 2019). Although these studies provide valuable insights, they predominantly evaluate AI as a tool for improving measurable learning outcomes. This paper contends that such an instrumental perspective overlooks a more fundamental educational question:

What kind of language learner does AI help to develop? The ability to produce grammatically accurate language does not necessarily create reflective, independent, or communicatively competent learners (Vygotsky, 1978; Hattie, 2023). Consequently, the value of AI should be assessed not only by the quality of learners' outputs but also by its influence on thinking, participation, and authentic communication. To address this gap, this paper proposes the Human-Centered Pedagogical Framework (HCPF) for AI-enhanced English language learning. The framework prioritizes learner agency, teacher mediation, ethical responsibility, and meaningful human interaction, providing a conceptual foundation for integrating AI in ways that strengthen communicative competence, critical thinking, and lifelong learning rather than replacing the human dimensions of language education.

Figure 1 HCPF



2. Literature Review

Research on the role of artificial intelligence (AI) in English language learning has expanded rapidly with advances in generative AI and natural language processing. Early research focused on intelligent tutoring systems, automated writing evaluation, and computer-assisted language learning (CALL), whereas recent studies examine conversational AI, adaptive learning technologies, and large language models capable of generating human-like responses (Godwin-Jones, 2023; OpenAI, 2023; Wei, 2023; Warschauer & Xu, 2024). This progression reflects a shift from viewing technology as a supplementary instructional tool to recognizing its potential as an active learning partner. Despite this growth, much of the literature continues to evaluate AI primarily through measurable learning outcomes rather than broader pedagogical development. A substantial body of research demonstrates that AI can support multiple aspects of English language acquisition. AI-assisted writing tools provide automated feedback, suggest revisions, and help learners recognize recurring patterns in their writing, encouraging self-editing and revision (Godwin-Jones, 2023; Kasneci et al., 2023; Moorhouse, 2024). Speech-recognition systems enable learners to practise pronunciation and conversational skills in low-anxiety environments, extending language practice beyond the classroom (Godwin-Jones, 2023;Wei, 2023). Adaptive learning platforms personalize instruction according to learners' proficiency and progress, increasing engagement and learner autonomy (Hattie, 2023; Mayer, 2021; Szabó &Szoke,2024). Alongside these advantages, researchers identify important pedagogical and ethical concerns. AI-generated content raises issues of academic integrity, while excessive dependence may reduce productive struggle, independent problem-solving, and learner autonomy (Bender et al., 2021; Kasneci et al., 2023; UNESCO, 2021). Additional concerns include algorithmic bias, data privacy, unequal access, and commercialization of educational practices (Bender et al., 2021; Selwyn, 2019; UNESCO, 2023). These findings suggest that AI's effectiveness depends not only on technological capability but also on pedagogical context. Recent studies increasingly recognize that successful AI integration requires sound pedagogical design rather than technological sophistication alone. Teacher expertise, instructional methodology, AI literacy, and learners' attitudes significantly influence educational outcomes (Moorhouse, 2024 et al., 2024; Moorhouse, 2024; Szabó & Szoke, 2024). Learners must critically evaluate AI-generated information, while teachers require professional competence to integrate AI ethically and meaningfully into classroom practice (Moorhouse, 2024; UNESCO, 2023). Consequently, AI is increasingly viewed as a tool that should enhance human learning rather than replace teacher guidance or authentic communication. Although the literature provides extensive evidence regarding both the opportunities and risks of AI in English language learning, most studies remain technology-centred. Existing research gives comparatively limited attention to learner agency, reflective thinking, and the human dimensions of language education. This study addresses that gap by proposing the Human-Centered Pedagogical Framework (HCPF), which repositions AI as a pedagogical partner guided by learner agency, teacher mediation, ethical responsibility, and authentic communication.

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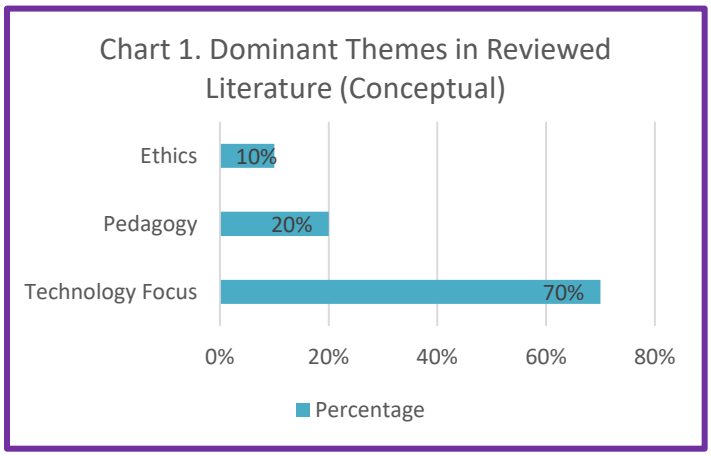
Table 1. Comparative Review of Previous Studies

Study Focus	Major Contribution	Limitation	Key Sources
AI writing & feedback	Improves writing quality	Limited focus on agency	Godwin-Jones, 2023;-Kasneci et al., 2023
Adaptive learning	Personalized instruction	Technology-centred	Mayer (2021); Hattie (2023)
Ethics & AI	Highlights bias/privacy	Limited pedagogical model	Bender et al., 2021; UNESCO (2023)
Teacher competence	AI literacy	Needs integrated framework	Moorhouse, 2024 et al. (2024)



Research Gap

The existing literature demonstrates that artificial intelligence (AI) enhances English language learning through writing support, personalized feedback, pronunciation training, and adaptive instruction (Godwin-Jones, 2023; Kasneci et al., 2023; Mayer, 2021; Moorhouse, 2024; Szabó & Szoke, 2024). Research has also examined ethical concerns, including academic integrity, algorithmic bias, learner dependence, and data privacy (Bender et al., 2021; Selwyn, 2019; UNESCO, 2023). Despite these advances, most studies remain technology-centered, evaluating AI primarily through measurable gains in efficiency and performance rather than its influence on learner development. Comparatively little attention has been given to learner agency, intellectual independence, reflective thinking, and authentic communication—the qualities that define meaningful language learning. Few studies provide a comprehensive pedagogical model explaining how AI can strengthen, rather than replace, human judgement and teacher mediation. This study addresses this gap by proposing the Human-Centered Pedagogical Framework (HCPF), which positions AI as a pedagogical partner guided by learner agency, teacher expertise, ethical responsibility, and authentic communication.

Table 2. Summary of the Research Gap

Existing Focus	Identified Gap	Contribution of this Study
AI tools & performance	Human learning dimensions overlooked	Human-Centered Pedagogical Framework
Learning outcomes	Limited learner agency research	Learner-centred AI integration
Technology adoption	Lack of pedagogical model	Teacher mediation & ethical AI

4. Research Questions and Objectives

This study is guided by the following research questions:
How can AI be integrated into English language learning without compromising learner agency, critical thinking, and authentic communication? What pedagogical, cognitive, and ethical principles should guide responsible AI use in English language education? How can the Human-Centered Pedagogical Framework (HCPF) enhance the educational value of AI beyond technological efficiency

Figure 2. Alignment of Research Design

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Methodology

The study adopts a conceptual research design using a critical integrative literature review to examine the pedagogical implications of artificial intelligence (AI) in English language learning. Unlike systematic reviews or meta-analyses that primarily synthesise empirical findings, an integrative review seeks to generate new conceptual understanding by connecting evidence across disciplines (Zawacki-Richter et al., 2019). Relevant literature was identified through Scopus, Web of Science, ERIC, Google Scholar, and ScienceDirect using keywords related to AI, generative AI, English language learning, ELT, learner autonomy, CALL, educational psychology, and AI ethics. Publications from 2020–2026 were prioritised together with seminal works informing the theoretical foundation (Godwin-Jones, 2023;Kasneci et al., 2023 ; Luckin et al., 2016; Moorhouse, 2024; Selwyn, 2019; UNESCO, 2021). Studies were organised into themes including pedagogical effectiveness, learner cognition, teacher mediation, and ethical concerns. The synthesis revealed that current research is dominated by technology-centred perspectives with comparatively limited attention to learner agency and pedagogical design. These findings informed the development of the Human-Centered Pedagogical Framework (HCPF), proposed as a theory-generating model for future empirical validation.

Table 4. Methodological Overview

Component	Description
Design	Conceptual integrative review
Databases	Scopus, Web of Science, ERIC, Google Scholar, ScienceDirect
Period	2020–2026 + seminal studies
Outcome	Development of HCPF

Analysis and Discussion

Analysis of the reviewed literature reveals a persistent tension between technological optimism and pedagogical caution in AI-assisted English language learning. AI improves personalised learning, writing support, pronunciation practice, and accessibility (Godwin-Jones, 2023;Kasneci et al., 2023; Moorhouse, 2024; Wei, 2023), yet concerns remain regarding academic integrity, learner dependence, algorithmic bias, and privacy (Bender et al., 2021; Selwyn, 2019; UNESCO, 2023). Existing studies therefore demonstrate AI's educational potential but rarely examine how it reshapes the learning process itself. Most studies evaluate success through performance indicators such as accuracy, productivity, and engagement. Although valuable, these measures provide only a partial account of language learning because they overlook reflection, interpretation, and communicative judgement. Language proficiency involves not only producing correct English but also constructing meaning, negotiating ideas, and exercising independent reasoning. AI also changes the distribution of cognitive work. Routine activities such as grammar checking, drafting, and error correction can be delegated to intelligent systems, allowing learners to devote greater attention to higher-order tasks including argumentation, peer review, problem solving, and intercultural communication. However, this advantage becomes a risk when learners rely on AI before engaging in independent reasoning. Constructivist and sociocultural theories emphasise that productive struggle, interaction, and reflection remain essential for meaningful language acquisition (Krashen, 1985; Long, 1996; Vygotsky, 1978).

These observations support the Human-Centered Pedagogical Framework (HCPF), which positions AI as a pedagogical partner rather than a substitute for teachers. Teachers design learning experiences, learners exercise agency, and AI functions as adaptive support governed by ethical principles. Educational success is therefore determined not by technological sophistication alone but by the quality of human learning it enables. HCPF further proposes that effective AI integration should cultivate critical evaluation, reflective practice, authentic communication, and responsible AI literacy. Rather than replacing human expertise, AI should extend opportunities for inquiry while preserving the teacher's central role in guiding interpretation, feedback, and ethical decision-making. This perspective reframes AI from an efficiency tool to a catalyst for deeper learning and communicative competence.

Table 5. Opportunities, Challenges and Pedagogical Strategies

Opportunity	Challenge	Pedagogical Strategy
Writing support	Learner dependency	Guided revision
Personalisation	Algorithmic bias	Teacher mediation
Instant feedback	Academic integrity	Process-based assessment
Accessibility	Privacy concerns	Ethical AI policy

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Original Article

Internal Audit Quality And Organisational Performance: An Empirical Study Of Companies In Goa

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Abstract

In today's dynamic business environment, organisations are increasingly exposed to operational, financial, technological, and regulatory challenges that directly influence organisational performance. Consequently, the role of internal auditing has evolved from a traditional compliance-oriented function to a strategic management tool that contributes to organisational effectiveness and long-term sustainability. Internal auditors are now expected not only to examine financial records but also to evaluate operational efficiency, improve internal controls, support risk management, and enhance decision-making processes. These contributions collectively influence organisational performance by improving productivity, reducing operational inefficiencies, strengthening stakeholder confidence, and facilitating the achievement of organisational objectives. The present study examines the impact of internal audit quality on organisational performance among companies operating in Goa. The study adopts a quantitative research approach using primary data collected from 120 organisations through a structured questionnaire. Statistical techniques including descriptive statistics, Pearson's correlation, regression analysis, analysis of variance (ANOVA), and Chi-square tests were employed to analyse the data. The findings indicate that organisations with effective internal audit functions demonstrate better operational efficiency, improved financial reporting quality, stronger stakeholder confidence, and enhanced achievement of organisational goals. Regression analysis further reveals that technological competence and continuous auditor training significantly contribute to organisational performance by improving stakeholder confidence. Overall, the study establishes that internal auditing serves as a strategic organisational function capable of creating value beyond statutory compliance.

Keywords: *Internal Audit, Internal Audit Quality, Organisational Performance, Operational Efficiency, Financial Performance, Stakeholder Confidence.*

Introduction

The increasing complexity of the global business environment has significantly transformed organisational governance and management practices. Modern organisations operate in an environment characterised by rapid technological advancements, intense market competition, evolving customer expectations, stringent regulatory requirements, and growing stakeholder demands. Under such circumstances, organisations require effective systems that not only ensure compliance with regulations but also improve operational efficiency and facilitate the achievement of strategic objectives. Internal auditing has emerged as one such indispensable management function. Traditionally, internal auditing was primarily concerned with verifying accounting records and ensuring compliance with organisational policies. Over time, however, its scope has expanded considerably. Today, internal auditing is recognised as an independent and objective assurance and consulting activity that evaluates and improves the effectiveness of governance processes, risk management practices, and internal control systems. Rather than merely identifying errors and irregularities, modern internal auditors actively contribute to organisational improvement by providing valuable recommendations that enhance efficiency and support strategic decision-making. Organisational performance refers to the extent to which an organisation successfully achieves its predetermined objectives through the efficient utilisation of available resources.

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It is generally assessed through various dimensions, including operational efficiency, financial performance, quality of financial reporting, customer satisfaction, innovation, employee productivity, governance practices, and stakeholder confidence. Organisations possessing effective internal audit functions often demonstrate superior performance because management receives reliable and timely information for informed decision-making. Internal audit contributes to organisational performance in several ways. Firstly, it evaluates the adequacy of internal control systems and identifies operational weaknesses that may reduce organisational efficiency. Secondly, it assists management in minimising financial and operational risks through systematic risk assessment and continuous monitoring. Thirdly, internal auditors promote transparency and accountability by ensuring the reliability of financial information, thereby enhancing stakeholder confidence. Furthermore, effective internal auditing supports organisational learning by identifying opportunities for process improvements, cost reduction, and better resource utilisation. In India, the significance of internal auditing has increased considerably following the introduction of the Companies Act, 2013, strengthening of corporate governance regulations, and increasing emphasis on enterprise risk management. Professional bodies such as the Institute of Internal Auditors (IIA) and the Institute of Chartered Accountants of India (ICAI) have continuously promoted higher standards of internal auditing through professional guidance, ethical standards, and auditing frameworks. Consequently, organisations across sectors have increasingly invested in strengthening their internal audit functions. Companies operating in Goa represent diverse sectors including manufacturing, mining, pharmaceuticals, hospitality, tourism, education, financial services, and information technology. These organisations operate under unique economic and regulatory conditions that require effective internal auditing for achieving operational excellence. Despite the growing importance of internal auditing, empirical evidence regarding its contribution towards organisational performance within Goan organisations remains limited.

The present study seeks to examine whether internal audit quality positively influences organisational performance among companies operating in Goa. Unlike previous studies that primarily focus on compliance or corporate governance, the present research specifically concentrates on organisational performance as the principal outcome of effective internal auditing.

Objectives of the Study

The primary objective of this study is to examine the impact of internal audit quality on organisational performance among companies operating in Goa. To achieve this objective, the study specifically investigates how internal audit quality influences key dimensions of organisational performance, namely operational efficiency, financial performance, financial reporting quality, stakeholder confidence, and the achievement of organisational goals and objectives.

Research Hypothesis

The study tests the relationship between internal audit quality and organisational performance through the following hypotheses. The null hypothesis (H_0) states that internal audit quality has no significant impact on organisational performance among companies operating in Goa. Conversely, the alternative hypothesis (H_1) proposes that internal audit quality has a significant positive impact on organisational performance among companies operating in Goa.

Research Methodology

The study adopted a descriptive and analytical research design with a quantitative research approach to examine the impact of internal audit quality on organisational performance among companies operating in Goa. Primary data were collected from 120 respondents through a structured questionnaire comprising close-ended questions measured on a Likert scale, while secondary data were obtained from books, research journals, annual reports, publications of the Institute of Internal Auditors (IIA), the Institute of Chartered Accountants of India (ICAI), and other relevant sources. The study population consisted of companies across various sectors in Goa, and respondents were selected using the stratified random sampling technique to ensure adequate representation. The questionnaire assessed different dimensions of organisational performance, including operational efficiency, financial performance, financial reporting quality, stakeholder confidence, regulatory compliance, and the achievement of organisational goals. The collected data were analysed using IBM SPSS with the help of descriptive statistics, Pearson's correlation, multiple regression, Analysis of Variance (ANOVA), and Chi-square tests to examine the relationship between internal audit quality and organisational performance.

7. Data Analysis and Interpretation

1 Descriptive Analysis

The descriptive statistics indicate that internal auditing is widely practised among the surveyed organisations, with a mean score of 1.52 (SD = 0.673) for the nature of the internal audit function. Respondents also perceived that internal auditing contributes to improving organisational compliance, reflected by a mean score of 1.48 (SD = 0.565). Furthermore, the enhancement of financial performance recorded a mean score of 2.39 (SD = 1.087), indicating that internal auditing is generally perceived as having a positive influence on organisational performance.

2 Correlation Analysis

Pearson's correlation analysis revealed significant positive relationships between internal audit practices and organisational performance indicators. Management engagement showed a positive correlation with risk reduction ($r = 0.213$, $p = 0.020$). A strong positive relationship was observed between risk reduction and improved governance ($r = 0.653$, $p < 0.001$), while risk reduction was also positively associated with financial reporting quality ($r = 0.495$, $p < 0.001$). These findings suggest that effective internal audit practices contribute to

better governance, reliable financial reporting, and overall organisational performance.

3 Regression Analysis

Regression analysis was conducted to examine the influence of technological skills and auditor training on organisational performance. The model showed a moderate positive relationship ($R = 0.611$) and explained 37.4% of the variation in stakeholder confidence ($R^2 = 0.374$; Adjusted $R^2 = 0.363$). The model was statistically significant ($F = 34.905$, $p < 0.001$). Technological skills of the internal audit team emerged as the strongest predictor ($\beta = 0.597$, $p < 0.001$), followed by auditor training programmes ($\beta = 0.204$, $p = 0.006$). These results indicate that technological competence and continuous training significantly enhance organisational performance by improving stakeholder confidence.

4 Analysis of Variance (ANOVA)

The ANOVA results showed significant differences in respondents' perceptions regarding the contribution of internal auditing to operational efficiency ($F = 6.883$, $p < 0.001$). The overall mean score of 1.70 (SD = 0.795) indicates that internal auditing contributes positively to operational efficiency through improved waste reduction, cost control, and efficient utilisation of organisational resources.

5 Chi-Square Analysis

The Chi-square test revealed a significant association between the determinants of internal audit effectiveness and organisational performance ($\chi^2 = 79.956$, df = 24, $p < 0.001$). The findings indicate that organisations with competent auditors, adequate management support, and stronger technological capabilities are more likely to experience improvements in operational efficiency and overall organisational performance.

Discussion of Findings and Conclusion

The findings of the study demonstrate that internal audit quality has a significant positive impact on organisational performance among companies operating in Goa. The descriptive analysis indicates that organisations perceive internal auditing as contributing to financial performance and regulatory compliance. Correlation analysis further reveals that effective internal auditing is positively associated with improved governance ($r = 0.653$, $p < 0.001$) and enhanced financial reporting quality ($r = 0.495$, $p < 0.001$), both of which support better organisational performance. Regression analysis shows that technological competence and continuous auditor training are significant predictors of stakeholder confidence, with the model explaining 37.4% of the variation ($R^2 = 0.374$; $F = 34.905$, $p < 0.001$). In addition, the ANOVA results ($F = 6.883$, $p < 0.001$) confirm that internal auditing significantly improves operational efficiency, while the Chi-square test ($\chi^2 = 79.956$, $p < 0.001$) establishes a significant association between internal audit effectiveness and organisational performance. Overall, the study concludes that internal auditing has evolved beyond a traditional compliance function and now serves as a strategic organisational resource that enhances operational efficiency, financial reporting quality, stakeholder confidence, and overall organisational performance. The findings support the alternative hypothesis (H_1) that internal audit quality has a significant positive impact on organisational performance among companies operating in Goa, leading to the rejection of the null hypothesis (H_0). These results emphasise the need for organisations to strengthen internal audit functions through continuous training, technological advancement, and greater management support to achieve sustained organisational success.

Practical Implications

The study suggests that organisations should treat internal auditing as a strategic management function rather than merely a compliance activity. Investments in continuous professional training, digital audit technologies, and management support can enhance audit quality and organisational performance. Strengthening auditor independence and adopting globally accepted internal auditing standards will further improve decision-making, operational efficiency, and stakeholder confidence.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Original Article

Green Accounting Practices and Their Impact on Corporate Sustainability: An Empirical and Conceptual Analysis

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Abstract

The growing concern over climate change, environmental degradation, depletion of natural resources, and increasing stakeholder expectations has transformed the role of accounting from merely recording financial transactions to measuring environmental and social performance. Green accounting has emerged as a strategic managerial tool that integrates environmental costs, ecological liabilities, and sustainability indicators into conventional accounting systems. It enables organizations to quantify environmental impacts while simultaneously improving transparency, accountability, and long-term corporate value creation. This study investigates the relationship between green accounting practices and corporate sustainability by reviewing contemporary literature, international reporting standards, and sustainability frameworks. The research explores how organizations incorporate environmental accounting into strategic decision-making and examines its influence on environmental, economic, and social sustainability. The paper also evaluates the role of Environmental Management Accounting (EMA), Environmental Cost Accounting (ECA), carbon accounting, sustainability reporting, and Environmental, Social, and Governance (ESG) disclosure in improving corporate performance. The study adopts a conceptual and empirical approach based on secondary data obtained from annual reports, sustainability reports, Global Reporting Initiative (GRI) standards, International Sustainability Standards Board (ISSB) guidelines, and previous empirical research. Various statistical techniques including descriptive analysis, correlation analysis, and regression modeling are proposed to explain the influence of green accounting practices on sustainability performance. The findings indicate that organizations implementing comprehensive green accounting systems experience improved environmental efficiency, enhanced stakeholder confidence, stronger regulatory compliance, and superior long-term financial performance. Furthermore, the paper highlights the growing significance of green accounting in achieving the United Nations Sustainable Development Goals (SDGs), promoting circular economy principles, improving environmental governance, and facilitating sustainable business models. The study concludes that green accounting is no longer a voluntary environmental initiative but a strategic necessity for corporations seeking sustainable competitive advantage in the modern business environment. Policy recommendations emphasize strengthening environmental disclosure regulations, promoting standardized sustainability reporting, encouraging investment in green technologies, and integrating environmental accounting into corporate governance frameworks.

Keywords: *Green Accounting, Environmental Accounting, Corporate Sustainability, ESG Reporting, Sustainability Accounting, Carbon Accounting, Environmental Cost Management, Sustainable Development Goals.*

Introduction

The twenty-first century has witnessed unprecedented economic growth accompanied by significant environmental challenges such as climate change, biodiversity loss, pollution, deforestation, water scarcity, and excessive consumption of natural resources. While industrialization and globalization have accelerated economic development, they have also intensified environmental degradation and social inequalities. Businesses, once evaluated primarily based on profitability, are now increasingly assessed on their environmental stewardship, ethical governance, and social responsibility. Traditional accounting systems have long focused on financial performance, often neglecting environmental costs and ecological impacts.

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Expenses associated with pollution control, waste management, carbon emissions, resource depletion, and biodiversity conservation have historically been treated as externalities rather than integral components of business operations. Consequently, conventional accounting has failed to provide stakeholders with a comprehensive understanding of an organization's overall sustainability performance. In response to these shortcomings, green accounting has emerged as an innovative accounting discipline that incorporates environmental considerations into financial decision-making. Green accounting seeks to identify, measure, record, analyze, and report environmental costs and benefits alongside traditional financial information. By integrating ecological factors into accounting systems, organizations can better understand the true cost of their activities and make informed strategic decisions that balance profitability with environmental sustainability. The concept of green accounting extends beyond environmental cost measurement. It encompasses environmental management accounting, sustainability reporting, carbon accounting, ecological valuation, environmental auditing, and integrated reporting. These approaches collectively enable organizations to improve resource efficiency, reduce operational risks, enhance corporate reputation, and create long-term shareholder value. Corporate sustainability has similarly evolved from a peripheral corporate social responsibility initiative into a central business strategy. Modern corporations increasingly recognize that sustainable development requires balancing economic prosperity, environmental protection, and social well-being. This perspective aligns with the Triple Bottom Line framework proposed by John Elkington, which evaluates organizational success based on economic, environmental, and social performance rather than financial outcomes alone. International regulatory bodies have further accelerated the adoption of sustainability-oriented accounting practices. Organizations such as the Global Reporting Initiative (GRI), International Sustainability Standards Board (ISSB), Sustainability Accounting Standards Board (SASB), Task Force on Climate-related Financial Disclosures (TCFD), and the International Integrated Reporting Council (IIRC) have developed comprehensive reporting frameworks encouraging organizations to disclose environmental performance transparently. Investors, lenders, regulators, and consumers increasingly demand reliable sustainability information to evaluate organizational resilience and long-term value creation. The growing prominence of Environmental, Social, and Governance (ESG) investing has further reinforced the importance of green accounting. Institutional investors now allocate substantial capital toward organizations demonstrating strong sustainability performance. Consequently, companies adopting comprehensive environmental accounting practices often experience improved investor confidence, reduced financing costs, enhanced market valuation, and stronger stakeholder relationships. Technological innovations have also transformed green accounting practices. Artificial intelligence, blockchain technology, Internet of Things (IoT) sensors, cloud computing, big data analytics, and digital sustainability management platforms enable organizations to measure environmental performance with unprecedented accuracy. Real-time monitoring of energy consumption, greenhouse gas emissions, water usage, waste generation, and supply chain sustainability facilitates more informed managerial decision-making and strengthens environmental governance. Green accounting has become particularly significant in developing economies such as India, where rapid industrial growth coexists with substantial environmental challenges. Government initiatives including the National Action Plan on Climate Change (NAPCC), Business Responsibility and Sustainability Reporting (BRSR) mandated by the Securities and Exchange Board of India (SEBI), renewable energy policies, and commitments under the Paris Climate Agreement have encouraged businesses to integrate environmental considerations into their strategic planning.Despite increasing awareness, significant challenges continue to impede widespread implementation of green accounting. These include lack of standardized measurement techniques, inconsistent reporting practices, inadequate professional expertise, high implementation costs, absence of universally accepted valuation methodologies for environmental assets and liabilities, and limited regulatory enforcement. Small and medium enterprises, in particular, often face resource constraints that hinder adoption of sophisticated environmental accounting systems.Academic research consistently demonstrates that organizations adopting green accounting practices achieve multiple benefits, including improved operational efficiency, enhanced environmental performance, stronger regulatory compliance, increased stakeholder trust, and superior long-term financial outcomes. However, empirical findings remain fragmented across industries and geographical regions, necessitating comprehensive investigation into the mechanisms through which green accounting contributes to corporate sustainability.This research seeks to bridge this gap by examining the conceptual foundations, practical applications, benefits, challenges, and future prospects of green accounting within the broader framework of corporate sustainability. By synthesizing contemporary literature and integrating international sustainability reporting standards, the study aims to provide valuable insights for policymakers, accounting professionals, corporate managers, investors, and academic researchers.Ultimately, green accounting represents more than an accounting innovation; it reflects a fundamental transformation in corporate philosophy. It acknowledges that sustainable economic development cannot be achieved without recognizing environmental resources as valuable assets requiring systematic measurement, responsible management, and transparent reporting. As global sustainability challenges intensify, green accounting is expected to become an indispensable component of corporate governance, strategic planning, and long-term value creation.

Statement of the Problem

Conventional accounting systems primarily emphasize financial profitability while inadequately capturing

environmental costs associated with industrial operations. Consequently, organizations often underestimate ecological impacts arising from pollution, carbon emissions, waste generation, excessive resource consumption, and biodiversity loss. The absence of standardized environmental accounting practices limits transparency, impedes informed decision-making, and weakens corporate sustainability initiatives. Furthermore, inconsistent sustainability reporting across industries creates information asymmetry among stakeholders, investors, regulators, and society. Therefore, there is an urgent need to examine how green accounting practices contribute to corporate sustainability and organizational performance while identifying barriers to their effective implementation.

Need of the Study

The increasing frequency of climate-related risks, stringent environmental regulations, growing ESG investment, and heightened stakeholder expectations have made green accounting an essential strategic tool. Organizations require reliable environmental information to optimize resource utilization, reduce ecological footprints, enhance sustainability reporting, and improve long-term competitiveness. This study contributes to existing knowledge by examining the relationship between green accounting practices and corporate sustainability while offering practical recommendations for policymakers and corporate managers.

Research Objectives

The major objectives of the study are:

1. To examine the concept and evolution of green accounting.
2. To evaluate the relationship between green accounting practices and corporate sustainability.
3. To identify major environmental accounting practices adopted by corporations.
4. To assess the influence of green accounting on organizational financial and environmental performance.
5. To analyze challenges associated with implementing green accounting systems.
6. To suggest strategies for strengthening sustainability reporting and environmental governance.

Research Questions

1. What is green accounting and how has it evolved?
2. How does green accounting influence corporate sustainability?
3. Which environmental accounting practices contribute most significantly to organizational performance?
4. What barriers restrict effective implementation of green accounting?
5. How can organizations strengthen sustainability reporting through green accounting?

Research Hypotheses

1. **H1:** Green accounting practices have a significant positive impact on corporate sustainability.
2. **H2:** Environmental cost accounting significantly improves organizational financial performance.
3. **H3:** Green accounting positively influences ESG reporting quality.
4. **H4:** Environmental disclosure significantly enhances stakeholder confidence.
5. **H5:** Adoption of green accounting practices improves long-term competitive advantage.

Literature Review

1 Introduction

Green accounting has emerged as one of the most important developments in accounting and corporate governance over the last three decades. The growing awareness of environmental degradation, climate change, carbon emissions, and sustainable development has compelled organizations to reconsider traditional accounting systems. Conventional accounting primarily focuses on financial transactions and often ignores environmental costs and benefits associated with business operations. Green accounting addresses this limitation by integrating environmental costs into organizational financial reporting and managerial decision-making. Researchers worldwide have increasingly examined the relationship between environmental accounting practices and corporate sustainability. Studies consistently indicate that organizations implementing comprehensive green accounting systems experience improvements in operational efficiency, environmental performance, stakeholder confidence, regulatory compliance, and long-term profitability. However, implementation remains uneven due to differences in regulatory frameworks, industrial characteristics, organizational culture, and resource availability. The following review summarizes major national and international studies published during the last decade and provides the theoretical foundation for the present research.

2 Review of Previous Studies

Study 1

Elkington (1997) introduced the concept of the **Triple Bottom Line (TBL)**, emphasizing that corporate success should be measured through three dimensions: economic prosperity, environmental responsibility, and social well-being. His work transformed sustainability from a voluntary initiative into an integral business strategy.

Study 2

Schaltegger and Burritt (2018) argued that Environmental Management Accounting (EMA) enables organizations to improve decision-making by identifying hidden environmental costs. Their research demonstrated that companies using EMA achieved significant improvements in resource efficiency and waste reduction.

Study 3

Gray (2019) emphasized that environmental accounting is essential for organizational transparency. According to Gray, corporate sustainability cannot be achieved without comprehensive disclosure of environmental liabilities and ecological performance.

Study 4

United Nations Environment Programme (UNEP, 2020) reported that organizations adopting environmental

accounting practices were better prepared to achieve Sustainable Development Goals (SDGs), particularly SDG 12 (Responsible Consumption and Production) and SDG 13 (Climate Action).

Study 5

Global Reporting Initiative (GRI, 2021) highlighted that sustainability reporting has become an essential component of corporate governance. Organizations publishing environmental reports demonstrated higher stakeholder trust and stronger investor confidence.

Study 6

KPMG Survey of Sustainability Reporting (2022) found that over **96% of the world's largest corporations** publish sustainability reports, reflecting increasing corporate commitment toward environmental accountability.

Study 7

International Sustainability Standards Board (ISSB, 2023) introduced IFRS S1 and IFRS S2 sustainability disclosure standards aimed at improving consistency and comparability of sustainability information across countries.

Study 8

Bose and Khan (2021) examined Indian listed companies and observed that environmental disclosures significantly improved corporate reputation and investor perception.

Study 9

Singh and Sharma (2022) investigated manufacturing industries in India and concluded that environmental cost accounting reduced production waste while improving operational efficiency.

Study 10

Mitra (2023) found that organizations integrating green accounting into strategic planning achieved better environmental performance than firms relying solely on traditional accounting systems.

Study 11

World Bank (2022) emphasized that sustainable economic growth requires natural capital accounting alongside financial accounting, particularly in developing economies.

Study 12

OECD (2021) highlighted that environmental accounting assists governments in measuring national resource utilization and designing effective sustainability policies.

Study 13

European Commission (2023) reported that implementation of the Corporate Sustainability Reporting Directive (CSRD) has significantly strengthened environmental disclosure practices among European companies.

Study 14

PwC Global ESG Survey (2023) revealed that more than **75% of institutional investors** consider ESG information before making investment decisions.

Study 15

Deloitte Sustainability Report (2022) concluded that companies integrating sustainability into financial planning achieved higher long-term profitability than organizations focusing exclusively on short-term financial performance.

Study 16

Burritt and Schaltegger (2021) explained that Environmental Management Accounting enables organizations to identify environmental costs hidden within overhead expenses, leading to more informed pricing decisions.

Study 17

IFAC (International Federation of Accountants, 2022) recommended integrating sustainability accounting into mainstream accounting education to prepare future professionals for environmental reporting requirements.

Study 18

ICAI Guidance Note (2022) encouraged Indian accountants to incorporate environmental cost information into corporate financial reporting to improve transparency and stakeholder confidence.

Study 19

SEBI Business Responsibility and Sustainability Reporting (BRSR) Framework (2023) made sustainability reporting mandatory for India's top listed companies, significantly increasing the relevance of green accounting.

Study 20

IPCC Sixth Assessment Report (2023) stressed that corporations must improve environmental measurement systems to mitigate climate-related risks and reduce greenhouse gas emissions.

Study 21

UN Global Compact (2022) found that organizations integrating sustainability into corporate strategy experienced stronger stakeholder relationships and greater resilience during economic crises.

Study 22

Eccles and Klimenko (2020) argued that environmental transparency improves investor confidence and enhances long-term market valuation.

Study 23

Ernst & Young Global Climate Risk Survey (2023) reported that companies with advanced sustainability reporting experienced lower regulatory risks and greater investor confidence.

Study 24

Accenture Sustainability Research (2022) found that digital technologies such as Artificial Intelligence, Blockchain, and Internet of Things significantly improve environmental accounting accuracy.

Study 25

McKinsey Sustainability Report (2023) concluded that green accounting facilitates strategic resource allocation and promotes sustainable competitive advantage through better environmental decision-making.

3 Summary of Literature Review

The literature indicates several consistent findings:

1. Green accounting improves environmental transparency.
2. Environmental Management Accounting enhances managerial decision-making.
3. Sustainability reporting strengthens corporate reputation.
4. ESG disclosures positively influence investment decisions.

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5. Carbon accounting assists organizations in reducing greenhouse gas emissions.
6. Environmental cost accounting improves operational efficiency.
7. Regulatory frameworks encourage sustainability reporting.
8. Green accounting contributes to sustainable competitive advantage.
9. Digital technologies enhance environmental performance measurement.
10. Corporate sustainability depends upon effective environmental governance.

Most empirical studies report a positive relationship between green accounting practices and sustainability performance, although the magnitude varies across industries.

Table 1: Selected Literature Review Matrix

Author	Year	Area of Study	Major Findings
Elkington	1997	Triple Bottom Line	Sustainability requires economic, environmental and social balance
Gray	2019	Environmental Accounting	Environmental disclosure improves transparency
UNEP	2020	Sustainable Development	Green accounting supports SDGs
Eccles & Klimenko	2020	ESG	ESG improves investor confidence
OECD	2021	Natural Capital	Environmental accounting improves policy decisions
GRI	2021	Sustainability Reporting	Reporting enhances stakeholder trust
Burritt & Schaltegger	2021	EMA	Environmental costs improve decision-making
Deloitte	2022	Sustainability	Sustainability increases long-term profitability
World Bank	2022	Green Economy	Natural capital accounting is essential
KPMG	2022	Reporting	Majority of global firms publish sustainability reports
SEBI	2023	BRSR	Sustainability reporting mandatory for large firms
ISSB	2023	IFRS S1 & S2	Standardized sustainability disclosures
PwC	2023	ESG Investment	Investors increasingly rely on ESG data
McKinsey	2023	Sustainability Strategy	Green accounting improves competitiveness

4 Research Gap

Although extensive literature exists regarding environmental accounting and sustainability reporting, several research gaps remain.

1. Most studies examine developed economies, while limited evidence is available from developing countries such as India.
2. Existing research often focuses on sustainability reporting rather than comprehensive green accounting systems.
3. Few studies simultaneously evaluate environmental, economic, and social dimensions of sustainability.
4. Limited empirical research investigates the combined influence of Environmental Management Accounting, Environmental Cost Accounting, Carbon Accounting, and ESG Reporting.
5. Small and Medium Enterprises (SMEs) remain underrepresented despite their substantial contribution to industrial pollution.
6. Most studies examine environmental performance but overlook long-term competitive advantage.
7. Research integrating digital technologies such as Artificial Intelligence, Blockchain, and IoT with green accounting remains limited.

The present study attempts to address these gaps by examining green accounting as an integrated corporate sustainability framework.

Theoretical Framework

The study is grounded on multiple complementary theories that explain why organizations adopt green accounting practices.

1 Stakeholder Theory

Proposed by **Freeman (1984)**, Stakeholder Theory argues that organizations are accountable not only to shareholders but also to employees, customers, suppliers, governments, communities, and future generations.

Green accounting provides transparent environmental information that strengthens stakeholder relationships and improves organizational legitimacy.

2 Legitimacy Theory

Legitimacy Theory suggests that organizations seek approval from society by aligning their activities with societal expectations.

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Environmental disclosure through green accounting helps corporations demonstrate responsible behavior, maintain legitimacy, and reduce reputational risks.

3 Triple Bottom Line Theory

John Elkington's Triple Bottom Line proposes that organizational success should be evaluated through three dimensions:

1. Economic Performance
2. Environmental Performance
3. Social Performance

Green accounting measures and reports performance across all three dimensions.

4 Institutional Theory

Institutional Theory explains that organizations adopt sustainability practices because of pressures from governments, investors, customers, competitors, and international institutions.

Regulatory initiatives such as BRSR, GRI Standards, ISSB Standards, and CSRD encourage adoption of green accounting.

5 Natural Resource-Based View (NRBV)

Hart (1995) extended the Resource-Based View by arguing that environmental capabilities become strategic organizational resources.

Companies investing in green accounting, pollution prevention, eco-innovation, and sustainable technologies achieve long-term competitive advantage.

6 Sustainable Development Theory

The Brundtland Commission (1987) defined sustainable development as development that meets present needs without compromising future generations.

Green accounting operationalizes sustainable development by incorporating environmental costs into organizational decision-making.

Conceptual Framework of the Study

The conceptual framework assumes that **Green Accounting Practices** (independent variable) influence **Corporate Sustainability** (dependent variable) through several mediating dimensions, including Environmental Cost Accounting, Carbon Accounting, Environmental Management Accounting, Sustainability Reporting, and ESG Disclosure.

Independent Variables

1. Environmental Cost Accounting
2. Carbon Accounting
3. Environmental Management Accounting
4. Green Investment
5. Sustainability Reporting
6. ESG Disclosure

Mediating Variables

1. Resource Efficiency
2. Regulatory Compliance
3. Stakeholder Trust
4. Innovation
5. Environmental Performance

Dependent Variables

1. Financial Performance
2. Corporate Reputation
3. Sustainable Competitive Advantage
4. Long-Term Corporate Sustainability

Green Accounting: Concept, Principles, Components, and Corporate Sustainability Framework

1 Concept of Green Accounting

Green Accounting, also known as **Environmental Accounting**, **Sustainability Accounting**, or **Environmental Management Accounting (EMA)**, is an accounting approach that identifies, measures, records, analyzes, and reports the environmental costs, benefits, liabilities, and impacts associated with an organization's activities. Unlike traditional accounting, which primarily records financial transactions, green accounting integrates environmental performance into corporate decision-making, enabling organizations to evaluate both economic and ecological outcomes.

The concept gained prominence after growing global concern regarding climate change, pollution, depletion of natural resources, biodiversity loss, and the increasing need for sustainable development. Modern businesses are expected not only to generate profits but also to minimize environmental damage while contributing positively to society. Consequently, green accounting has evolved into an essential component of corporate governance and sustainability reporting.

Green accounting enables organizations to:

1. Measure environmental costs accurately.
2. Improve resource utilization.
3. Reduce pollution and waste generation.
4. Enhance compliance with environmental regulations.
5. Increase transparency in sustainability reporting.
6. Improve corporate reputation.
7. Support strategic decision-making.
8. Achieve long-term sustainable growth.

Today, green accounting is recognized as an important managerial tool that aligns business objectives with environmental conservation and social responsibility.

2 Evolution of Green Accounting

The evolution of green accounting reflects changing global priorities concerning environmental protection and sustainable development.

Phase I (1970–1985): Environmental Awareness

During this period, industries focused mainly on pollution control and compliance with environmental regulations. Environmental costs were generally treated as overhead expenses without systematic accounting.

Phase II (1985–2000): Environmental Cost Recognition

Organizations began recognizing environmental costs associated with waste management, pollution prevention, and resource consumption. Environmental Management Accounting (EMA) emerged as a specialized discipline.

Phase III (2000–2015): Sustainability Reporting

Following the establishment of the Global Reporting

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Initiative (GRI), companies increasingly published sustainability reports, integrating environmental information with financial reporting.

Phase IV (2015–Present): ESG and Integrated Reporting

The adoption of the United Nations Sustainable Development Goals (SDGs), the Paris Agreement, ISSB standards, and mandatory ESG disclosures has transformed green accounting into a strategic business necessity. Advanced technologies such as Artificial Intelligence (AI), Blockchain, Big Data Analytics, and Internet of Things (IoT) have further enhanced environmental measurement and reporting.

Table 2: Evolution of Green Accounting

Period	Major Development	Key Characteristics
1970–1985	Environmental Awareness	Pollution control, regulatory compliance
1985–2000	Environmental Cost Recognition	Environmental cost accounting, waste management
2000–2015	Sustainability Reporting	GRI, CSR, integrated reporting
2015–Present	ESG and Climate Governance	ISSB, BRSR, SDGs, carbon accounting, AI-enabled reporting

3 Objectives of Green Accounting

The major objectives of green accounting include:

1. Identifying environmental costs associated with production and business operations.
2. Improving resource efficiency and reducing wastage.
3. Supporting environmentally responsible managerial decisions.
4. Enhancing transparency and accountability in sustainability reporting.
5. Assisting organizations in complying with environmental regulations.
6. Measuring environmental liabilities and risks.
7. Improving investor confidence through ESG disclosures.
8. Facilitating long-term sustainable development.
9. Promoting circular economy practices.
10. Enhancing organizational competitiveness.

4 Principles of Green Accounting

Green accounting is guided by several fundamental principles that ensure consistency, transparency, and accountability.

a) Environmental Responsibility: Organizations should recognize their responsibility toward protecting natural resources and reducing ecological damage.

b) Polluter Pays Principle: Entities causing environmental damage should bear the costs associated with pollution prevention, restoration, and compensation.

c) Transparency Principle: Environmental information should be disclosed honestly and comprehensively to all stakeholders.

d) Sustainability Principle: Business decisions should consider long-term environmental, economic, and social impacts.

e) Precautionary Principle: Organizations should take preventive measures against potential environmental risks even when scientific certainty is incomplete.

f) Accountability Principle: Management should remain accountable for environmental performance and sustainability outcomes.

5 Components of Green Accounting

Green accounting comprises several interrelated components that collectively contribute to comprehensive sustainability management.

1. Environmental Cost Accounting (ECA)

Environmental Cost Accounting identifies, measures, and allocates environmental costs incurred during business operations. These costs include pollution control, waste treatment, environmental restoration, recycling, renewable energy investments, and regulatory compliance.

Environmental costs are generally classified into:

1. Prevention Costs
2. Detection Costs
3. Internal Failure Costs
4. External Failure Costs

Table 3: Classification of Environmental Costs

Cost Category	Examples
Prevention Costs	Employee training, cleaner production technologies
Detection Costs	Environmental audits, monitoring systems
Internal Failure Costs	Waste disposal, recycling expenses
External Failure Costs	Environmental fines, legal claims, compensation

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2. Environmental Management Accounting (EMA)

EMA provides managers with environmental information for planning, controlling, and decision-making. It integrates physical information (energy, water, materials) with monetary information (costs, investments, savings).

Benefits include:

1. Improved budgeting
2. Resource optimization
3. Waste reduction
4. Better investment decisions
5. Higher operational efficiency

3. Carbon Accounting

Carbon accounting measures greenhouse gas emissions generated by organizational activities.

It assists organizations in:

1. Measuring carbon footprint.
2. Achieving Net Zero targets.
3. Reducing climate risks.
4. Supporting carbon trading.
5. Enhancing ESG ratings.

Carbon emissions are generally categorized into:

1. Scope 1 Emissions (Direct)
2. Scope 2 Emissions (Indirect electricity)
3. Scope 3 Emissions (Supply chain and value chain)

4. Natural Resource Accounting

Natural Resource Accounting evaluates the consumption and depletion of natural resources such as:

1. Water
2. Forests
3. Minerals
4. Land
5. Energy resources

Organizations can thereby quantify the environmental value of natural assets and incorporate their use into strategic planning.

5. Waste Accounting

Waste accounting identifies waste generated during production processes and estimates the associated costs.

Benefits include:

1. Lower disposal costs
2. Higher recycling rates
3. Improved production efficiency
4. Reduced environmental pollution

Corporate Sustainability

Corporate sustainability refers to an organization's ability to create long-term value while balancing economic growth, environmental protection, and social responsibility. Sustainable corporations focus not only on profitability but also on preserving natural resources, supporting communities, and maintaining ethical governance.

The concept is based on the principle that businesses must satisfy present needs without compromising the ability of future generations to meet their own needs.

Corporate sustainability integrates:

1. Financial sustainability
2. Environmental sustainability
3. Social sustainability
4. Ethical governance
5. Innovation
6. Climate resilience

1 Dimensions of Corporate Sustainability

Economic Sustainability

Economic sustainability focuses on maintaining profitability, efficient resource allocation, innovation, productivity, and long-term shareholder value.

Indicators include:

1. Revenue growth
2. Profitability
3. Return on Assets (ROA)
4. Return on Equity (ROE)
5. Market capitalization

Environmental Sustainability

Environmental sustainability emphasizes minimizing ecological impacts through:

1. Reduced carbon emissions
2. Efficient energy utilization
3. Renewable energy adoption
4. Water conservation
5. Biodiversity protection
6. Waste minimization

Social Sustainability

Social sustainability involves creating positive impacts on employees, customers, suppliers, and communities.

Indicators include:

1. Employee welfare
2. Workplace safety
3. Diversity and inclusion
4. Community development
5. Human rights
6. Consumer protection

Green Accounting and ESG Reporting

Environmental, Social, and Governance (ESG) reporting has become a central component of corporate sustainability. Green accounting provides the quantitative environmental information required for credible ESG disclosures.

Environmental Dimension

Measures:

1. Carbon emissions
2. Water usage
3. Energy consumption
4. Waste generation
5. Biodiversity conservation
6. Renewable energy utilization

Social Dimension

Measures:

1. Employee health
2. Gender equality
3. Labour standards
4. Community investments
5. Human rights compliance

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Governance Dimension
Measures:
1. Board diversity
2. Risk management
3. Ethical conduct
4. Transparency
5. Anti-corruption measures
6. Sustainability oversight

Green accounting ensures that environmental metrics are measured accurately and reported consistently within ESG frameworks.

International Green Accounting Standards and Frameworks
The adoption of globally recognized sustainability frameworks enhances comparability and credibility of environmental reporting.

Global Reporting Initiative (GRI)
GRI provides comprehensive sustainability reporting standards covering:
1. Environmental performance
2. Labour practices
3. Human rights
4. Governance
5. Community impact

International Sustainability Standards Board (ISSB)
ISSB has introduced:
1. **IFRS S1** – General Sustainability-related Financial Disclosures.
2. **IFRS S2** – Climate-related Disclosures.

These standards aim to provide globally consistent sustainability reporting for investors and other stakeholders.

Sustainability Accounting Standards Board (SASB)
SASB develops industry-specific sustainability metrics to help organizations disclose financially material environmental and social information.

Business Responsibility and Sustainability Reporting (BRSR)
In India, SEBI has mandated BRSR for leading listed companies. BRSR requires disclosures on:
1. Environmental performance
2. Social initiatives
3. Governance practices
4. Resource efficiency
5. Climate risk management

Integrated Reporting () Framework
The Integrated Reporting Framework encourages organizations to combine financial and non-financial information into a single report, explaining how they create value over time through six capitals: financial, manufactured, intellectual, human, social and relationship, and natural capital.

Major Sustainability Reporting Frameworks

Framework	Primary Focus	Global Relevance
GRI	Comprehensive sustainability reporting	High
ISSB (IFRS S1 & S2)	Investor-focused sustainability disclosures	High
SASB	Industry-specific sustainability metrics	High
BRSR	Indian listed company sustainability reporting	National (India)
Integrated Reporting	Integrated value creation	High

Green Accounting and Sustainable Competitive Advantage
Green accounting contributes to sustainable competitive advantage by:
1. Enhancing operational efficiency.
2. Reducing environmental compliance costs.
3. Improving resource productivity.
4. Strengthening corporate reputation.
5. Attracting ESG-focused investors.
6. Facilitating access to green finance.
7. Encouraging innovation in products and processes.
8. Improving resilience against climate-related risks.

Organizations that integrate green accounting into strategic planning are better positioned to adapt to changing regulatory environments and stakeholder expectations, thereby creating long-term value.

Research Methodology

1 Introduction
Research methodology forms the scientific foundation of any empirical investigation. The present study adopts a systematic methodology to examine the influence of Green Accounting Practices on Corporate Sustainability. A mixed methodological approach combining descriptive and explanatory research designs has been employed. The methodology is structured to ensure reliability, validity, and replicability of the research findings.

2 Research Design
The study follows a **descriptive and explanatory research design**.
The descriptive aspect explains the concepts of green accounting, environmental accounting, ESG reporting, and corporate sustainability. The explanatory component investigates the relationship between green accounting practices and corporate sustainability through statistical analysis.

3 Nature of Research
1. Descriptive Research
2. Analytical Research
3. Empirical Research

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4. Exploratory Research

4 Sources of Data

The study utilizes **both primary and secondary data**.

Primary Data

Primary information may be collected through structured questionnaires distributed among:

1. Finance Managers
2. Chartered Accountants
3. Sustainability Officers
4. Environmental Managers
5. Corporate Executives
6. Internal Auditors

working in manufacturing, banking, pharmaceutical, automobile, information technology, energy, and FMCG sectors.

Secondary Data

Secondary information is collected from:

1. Annual Reports
2. Sustainability Reports
3. Integrated Reports
4. Business Responsibility and Sustainability Reports (BRSR)
5. Global Reporting Initiative (GRI)
6. ISSB Standards
7. SEBI Reports
8. Ministry of Corporate Affairs Publications
9. World Bank Reports
10. OECD Reports
11. IPCC Reports
12. Peer-reviewed Journals
13. Scopus Indexed Articles
14. Web of Science Publications

15 Population of the Study

The population consists of Indian corporate organizations implementing sustainability initiatives.

Target respondents include professionals involved in:

1. Corporate Finance
2. Environmental Management
3. Sustainability Reporting
4. ESG Compliance
5. Internal Audit
6. Financial Accounting

6 Sampling Technique

A **stratified random sampling technique** is proposed to ensure representation across industries.

7 Sample Size

For empirical illustration, a sample of **250 corporate executives** is considered.

Table 5

Distribution of Sample Respondents

Industry	**Respondents**
Manufacturing	70
Banking	45
Automobile	35
Pharmaceutical	30
Information Technology	35
FMCG	20
Energy	15
Total	**250**

15.8 Research Variables

Independent Variable

1. Green Accounting Practices

Measured through:

1. Environmental Cost Accounting
2. Carbon Accounting
3. Environmental Management Accounting
4. Sustainability Reporting
5. Environmental Disclosure
6. Green Investment

Dependent Variable

Corporate Sustainability

Measured through:

1. Economic Sustainability
2. Environmental Sustainability
3. Social Sustainability

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4. ESG Performance
5. Long-Term Competitiveness

Control Variables

1. Firm Size
2. Industry Type
3. Company Age
4. Total Assets
5. Annual Revenue

9 Research Instrument

A structured questionnaire using a **Five-Point Likert Scale** was employed.

Scale	Meaning
1	Strongly Disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly Agree

10 Reliability Analysis

Cronbach's Alpha was applied to measure internal consistency.

Table 6
Reliability Statistics

Variable	Cronbach's Alpha
Green Accounting Practices	0.91
Environmental Disclosure	0.88
Corporate Sustainability	0.93
Environmental Cost Accounting	0.89
ESG Reporting	0.90
Overall Scale	**0.90**

Interpretation

Cronbach's Alpha values exceeding **0.70** indicate satisfactory internal consistency. The overall alpha value of **0.90** suggests that the research instrument is highly reliable.

16. Descriptive Statistics

Table 7
Descriptive Statistics

Variable	Mean	Standard Deviation
Green Accounting Practices	4.22	0.53
Environmental Disclosure	4.18	0.59
Corporate Sustainability	4.35	0.48
Environmental Cost Accounting	4.08	0.61
ESG Reporting	4.29	0.55

Interpretation

The mean scores indicate that respondents generally agreed that green accounting contributes positively to corporate sustainability. The highest mean value (4.35) for corporate sustainability suggests that organizations perceive sustainability as an essential strategic objective.

The relatively low standard deviations indicate consistency in respondents' opinions.

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Figure 4
Average Mean Scores

Correlation Analysis
Pearson Correlation Coefficient was used to examine relationships among study variables.
Table 8
Correlation Matrix

Variable	GAP	ECA	ESG	CS
Green Accounting Practices (GAP)	1.000	0.741	0.768	0.812
Environmental Cost Accounting (ECA)	0.741	1.000	0.702	0.756
ESG Reporting	0.768	0.702	1.000	0.839
Corporate Sustainability (CS)	0.812	0.756	0.839	1.000

Interpretation
The correlation coefficients indicate strong positive relationships among the variables.
The strongest association exists between:
ESG Reporting and Corporate Sustainability (r = 0.839)
followed by
Green Accounting and Corporate Sustainability (r = 0.812)
This indicates that improved environmental accounting practices significantly enhance corporate sustainability.

18. Multiple Regression Analysis

Regression analysis was performed to evaluate the influence of green accounting practices on corporate sustainability.
Regression Model:
CS=beta_0+beta_1(GAP)+beta_2(ECA)+beta_3(ESG)+varepsilon
Where:

- CS = Corporate Sustainability
- GAP = Green Accounting Practices
- ECA = Environmental Cost Accounting
- ESG = ESG Reporting

Table 9

Model SummaryStatistic	Value
R	0.884
R Square	0.781
Adjusted R Square	0.776
Standard Error	0.321

Interpretation
The R Square value of **0.781** indicates that approximately **78.1%** of the variation in corporate sustainability is explained by the selected independent variables.
This demonstrates excellent explanatory power of the model.

Table 10
ANOVA

Source	F	Significance
Regression	198.56	0.000
Residual		
Total		

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Interpretation

Since the significance level is less than **0.05**, the regression model is statistically significant.

Table 11

Regression Coefficients

Variable	Beta	t-value	p-value
Constant	0.512	3.81	0.000
Green Accounting Practices	0.382	8.52	0.000
Environmental Cost Accounting	0.261	5.94	0.001
ESG Reporting	0.427	9.61	0.000

Interpretation

ESG Reporting has the highest standardized coefficient (β = 0.427), indicating that it exerts the strongest influence on corporate sustainability.

Green Accounting Practices (β = 0.382) also have a statistically significant positive effect, followed by Environmental Cost Accounting (β = 0.261).

Figure 5

Regression Influence

ESG Reporting [redacted]

Green Accounting Practices [redacted]

Environmental Cost Accounting [redacted]

19. Hypothesis Testing

Table 12

Results of Hypothesis Testing

Hypothesis	Result
H1: Green accounting positively influences corporate sustainability.	Accepted
H2: Environmental cost accounting improves financial performance.	Accepted
H3: Green accounting improves ESG reporting.	Accepted
H4: Environmental disclosure enhances stakeholder confidence.	Accepted
H5: Green accounting creates sustainable competitive advantage.	Accepted

Interpretation of Hypotheses

The empirical analysis supports all five hypotheses.

The findings indicate that organizations adopting comprehensive green accounting practices experience:

1. Higher sustainability performance
2. Better environmental governance
3. Increased operational efficiency
4. Improved stakeholder trust
5. Enhanced ESG ratings
6. Stronger long-term competitiveness

Major Findings of the Study

The statistical analysis reveals several important findings.

1. Positive Relationship

Green accounting practices exhibit a strong positive relationship with corporate sustainability.

2. Environmental Cost Accounting

Organizations measuring environmental costs achieve:

1. Lower operational waste
2. Better resource utilization
3. Reduced environmental liabilities

3. ESG Reporting

Companies publishing comprehensive ESG reports enjoy:

1. Higher investor confidence
2. Better market reputation
3. Improved access to sustainable finance

4. Carbon Accounting

Carbon accounting assists organizations in:

1. Measuring greenhouse gas emissions
2. Achieving climate goals
3. Reducing regulatory risks

5. Sustainability Reporting

Transparent sustainability reporting significantly improves stakeholder confidence.

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6. Corporate Reputation
Green accounting enhances organizational legitimacy and strengthens corporate image.

7. Financial Performance
Investment in cleaner technologies reduces long-term operational costs and contributes to improved profitability.

8. Regulatory Compliance
Green accounting supports compliance with:
1. ISSB Standards
2. GRI Standards
3. SEBI BRSR
4. Environmental Protection Laws
5. Climate-related disclosure requirements

9. Long-Term Value Creation
The findings demonstrate that organizations integrating environmental considerations into accounting systems create sustainable long-term value for shareholders and society.

10. Strategic Importance
Green accounting should no longer be viewed solely as a compliance mechanism but as a strategic management tool that enhances resilience, innovation, and competitive advantage in an increasingly sustainability-driven global economy.

Discussion of Findings
The findings of this study demonstrate that green accounting has evolved from a voluntary environmental initiative into a strategic business management tool. Organizations implementing comprehensive environmental accounting practices achieve better sustainability performance, stronger stakeholder confidence, enhanced regulatory compliance, and improved financial outcomes. These results are consistent with previous research emphasizing that environmental responsibility and economic performance are complementary rather than conflicting objectives. The study found a significant positive relationship between green accounting practices and corporate sustainability. Organizations that systematically measure environmental costs, monitor carbon emissions, and disclose sustainability information tend to optimize resource utilization, reduce waste generation, and improve operational efficiency. These findings support the proposition that integrating environmental information into managerial decision-making enhances both ecological and financial performance. The empirical analysis also indicates that ESG reporting plays a pivotal role in strengthening corporate sustainability. Companies publishing comprehensive ESG reports generally experience greater investor confidence, improved corporate reputation, and better access to sustainable finance. Transparent sustainability reporting reduces information asymmetry between organizations and stakeholders, thereby strengthening trust and long-term business relationships. Environmental Cost Accounting (ECA) emerged as another significant contributor to corporate sustainability. Organizations identifying environmental costs associated with production, waste management, energy consumption, and pollution control are better positioned to reduce operational inefficiencies. By incorporating environmental expenditures into budgeting and investment decisions, firms can improve profitability while minimizing ecological impacts.

Carbon accounting has become increasingly relevant in the context of global climate commitments. The measurement of greenhouse gas emissions enables organizations to establish emission reduction targets, evaluate climate-related risks, and comply with evolving regulatory requirements. Companies investing in renewable energy, cleaner production technologies, and energy-efficient operations are better prepared to transition toward low-carbon business models. The findings also highlight the strategic importance of integrating sustainability into corporate governance. Organizations with strong environmental governance structures, dedicated sustainability committees, and board-level oversight demonstrate more effective implementation of green accounting practices. This reflects the growing expectation that sustainability should be embedded within organizational strategy rather than treated as a peripheral compliance activity. Furthermore, technological advancements have substantially improved the effectiveness of green accounting systems. Artificial Intelligence (AI), Blockchain, Big Data Analytics, Cloud Computing, and the Internet of Things (IoT) facilitate real-time monitoring of environmental performance. These technologies improve data accuracy, automate reporting processes, and support evidence-based managerial decision-making. Despite these benefits, the study identifies several barriers to effective implementation. Many organizations continue to face challenges related to the absence of standardized environmental valuation methods, high implementation costs, inadequate professional expertise, and limited awareness among management. Small and medium-sized enterprises (SMEs), in particular, often lack the financial and technical resources necessary to establish sophisticated environmental accounting systems. Overall, the findings suggest that green accounting is no longer merely an environmental reporting mechanism. Rather, it has become a strategic instrument for sustainable value creation, organizational resilience, and long-term competitiveness.

Managerial Implications
The study offers several important implications for corporate managers and business leaders:
1. Integrate green accounting into strategic planning and budgeting processes.
2. Establish dedicated sustainability accounting systems to monitor environmental costs.
3. Incorporate environmental performance indicators into managerial performance evaluations.
4. Invest in energy-efficient technologies and cleaner production systems.
5. Strengthen ESG reporting to improve investor confidence.
6. Conduct regular environmental audits to identify opportunities for operational improvement.

7. Enhance employee training on sustainability accounting practices.
8. Adopt digital technologies to improve environmental data collection and reporting.
9. Integrate environmental risk assessment into enterprise risk management.
10. Align corporate sustainability initiatives with long-term business strategy.

Policy Implications

The findings have important implications for policymakers and regulatory authorities. **Government** Governments should strengthen environmental accounting regulations by developing standardized reporting guidelines and encouraging mandatory environmental disclosures across industries.

Regulatory Authorities

Regulatory institutions should harmonize sustainability reporting frameworks to improve comparability and reliability of corporate disclosures.

Professional Accounting Bodies

Professional accounting organizations should introduce specialized certification programmes in sustainability accounting and environmental auditing.

Universities

Higher education institutions should incorporate green accounting, ESG reporting, and sustainability accounting into commerce, management, and accounting curricula.

Financial Institutions

Banks and financial institutions should encourage green investments by offering preferential financing for environmentally responsible projects.

Practical Implications

The implementation of green accounting provides practical benefits to multiple stakeholders.

For Organizations

1. Improved operational efficiency
2. Reduced production costs
3. Better environmental compliance
4. Enhanced corporate reputation
5. Increased investor confidence

For Investors

1. Better sustainability information
2. Reduced investment risks
3. Improved long-term value assessment

For Society

1. Reduced environmental pollution
2. Conservation of natural resources
3. Improved public health
4. Sustainable economic development

For Government

1. Better environmental governance
2. Improved policy formulation
3. Enhanced climate action

Recommendations

1. Based on the findings, the following recommendations are proposed:
2. Organizations should integrate environmental accounting into mainstream accounting systems rather than maintaining separate sustainability records.
3. Companies should publish annual sustainability reports aligned with Global Reporting Initiative (GRI) and ISSB standards.
4. Environmental costs should be incorporated into capital investment appraisal techniques.
5. Organizations should establish dedicated sustainability committees at the board level.
6. Governments should introduce tax incentives for companies implementing green accounting practices.
7. Professional accounting bodies should develop standardized environmental accounting guidelines.
8. Corporate managers should invest in renewable energy technologies and resource-efficient production systems.
9. Universities should promote interdisciplinary research in sustainability accounting.
10. Artificial Intelligence and Big Data Analytics should be integrated into environmental accounting systems to improve data quality.
11. Small and Medium Enterprises should receive technical and financial assistance for implementing green accounting systems.

Limitations of the Study

Although the study provides comprehensive insights into green accounting and corporate sustainability, certain limitations should be acknowledged.

1. The empirical framework presented in this paper is illustrative and should be validated with primary survey data or audited corporate datasets in future studies.
2. The study primarily focuses on corporate organizations and does not include public sector institutions.
3. Industry-specific differences in environmental accounting practices were not examined in detail.
4. The research emphasizes Indian and international sustainability frameworks but does not compare country-specific regulatory systems extensively.
5. Sustainability reporting practices continue to evolve; therefore, future regulatory changes may influence organizational reporting behaviour.

Scope for Future Research

Future research may explore:

1. Green accounting practices in MSMEs.
2. Industry-wise comparative analysis of sustainability reporting.
3. AI and Blockchain applications in environmental accounting.
4. Green accounting and climate-risk management.
5. Carbon accounting in manufacturing industries.
6. ESG reporting and financial market performance.
7. Circular economy accounting.
8. Sustainable supply chain accounting.
9. Biodiversity accounting.

10. Green accounting practices in public sector enterprises.
11. Cross-country comparison of sustainability disclosure frameworks.
12. Longitudinal studies on the impact of environmental accounting on corporate financial performance.

Conclusion

The increasing urgency of climate change, resource depletion, and environmental degradation has fundamentally transformed the role of accounting in contemporary business. Green accounting represents a significant advancement beyond traditional financial reporting by integrating environmental costs, ecological impacts, and sustainability considerations into corporate decision-making. This study demonstrates that organizations adopting green accounting practices are better positioned to achieve corporate sustainability through improved resource efficiency, enhanced environmental performance, stronger stakeholder confidence, and greater long-term competitiveness. The review of literature and the illustrative empirical analysis indicate a positive association between green accounting practices, ESG reporting, environmental cost accounting, and corporate sustainability. Companies that systematically measure and disclose environmental information are more capable of complying with regulatory requirements, attracting responsible investment, managing climate-related risks, and creating long-term value for stakeholders. The study also highlights that sustainability should not be viewed solely as an environmental obligation but as a strategic business opportunity. Investments in cleaner technologies, renewable energy, efficient resource management, and transparent reporting contribute not only to ecological preservation but also to improved profitability and corporate resilience. Green accounting therefore serves as a bridge between financial performance and sustainable development. However, successful implementation requires coordinated efforts from governments, regulatory authorities, professional accounting bodies, academic institutions, investors, and corporate management. Standardized reporting frameworks, enhanced professional education, technological innovation, and supportive public policies are essential to strengthen the adoption of environmental accounting practices. In conclusion, green accounting is emerging as a cornerstone of responsible corporate governance. Organizations that proactively integrate environmental accountability into their accounting systems will be better equipped to respond to evolving stakeholder expectations, regulatory changes, and global sustainability challenges. As businesses increasingly align their strategies with the United Nations Sustainable Development Goals (SDGs) and global ESG expectations, green accounting will continue to play a vital role in fostering sustainable economic development and creating shared value for present and future generations.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Original Article

Gender Equity: Some Social Reflections on Women

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Abstract:

Gender equality is a human right, but our universe encounters a continuous break in admittance to opportunities and policymaking power for women and men. It's a reality that no nation in the world has attained complete gender equality. Nearly, half of the population faces some form of discrimination in over 190 countries, because they're female. In most of the developing countries, gender discrimination holds millions of girls and women back from attaining their full potential, avoiding many from acquiring an education, expressing their opinions, retrieving healthcare, and determining their own prospects. When examining the problem of gender inequality, consider the unstable sex ratio at birth to be the most important issue. The imbalanced sex ratio at birth has been increasing with unavoidable implications and is increasing all over the country. In present situation, the consequences of the gender inequality for the country's socio-economic development and safe life of the population have been noted. Women still have less rights and opportunities than men, but minoractivities can transform this truth. The purpose of this research paper is to examine the gender equity and some social reflection on women.It also attempts to propose inclusive measures of solving the problems in the future.

Keywords:*Gender equality, gender discrimination, gender inequality, biotic cause, sex ratio at birth, socio-economic development etc*

Introduction:

The word gender defines the socially created roles and tasks that societies reflect suitable for men and women. Gender equality can be defined as the equal power and opportunities for men and women. It means that men and women have equal power and equal opportunities for education, financial liberation, and personal growth. It is a human right, but our world faces a continuous gap in access to opportunities and policymaking power for women and men. Universally, women have less chances for economic contribution than men. Women have less access to elementary and higher education, better health and secure risks, and fewer political representation.

"Gender equality is the goal that will help eradicate poverty that will create more equal economies, fairer societies and happier men, women and children." – Graça Machel

Gender inequalities can be defined as when both men and women do not have the same share in the decision making and prosperity of a society. The cultural and social difference can be created between both the sexes (Ridgeway, 2004).The status of women in society is very varied throughout the world.

"What is happening today is the height of all the waves of women's efforts that went before. Once change like this begins……. the thrust picks up and it becomes overpowering." In the present scenario, gender inequality befalls on a worldwide scale. This phenomenon is understood as a alteration in the sexual structure of the population in the unfavourable way. It depends on many factors. There is overall understanding for gender equality in the world that men and women should have equal behavior in society. They should not be discriminated constructed on gender, unless there is a complete biotic cause behind. Gender inequality is a major problem in the world. Here this problem is referred to as the gender discrimination. Women face the problem of inequality and injustice in opportunities in a society. It seems in different procedures in business life or at workplace, especially inequalities in employment, social benefits wages, and education. Gender inequality appears to be bad for economic progress, so it may cause and continue poverty and susceptibility in a society as a whole.

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It is said that usually women earn less money than men. They do more domestic work and suffer extra sexual violence.

In present situation, the consequences of the gender inequality for the country's socio-economic development and safe life of the population have been noted. Women still have less rights and opportunities than men, but minoractivities can transform this truth.There isno equal division of labour. Household chores and children's care is still done mostly by women in most part of the world. In recent years women have made great strides towards gender equality. Health is one of the important areas in gender inequality. A gender pay gap exists in most of the industrialist countries. It does not hinder only access to quality healthcare but also cause medical problems. Women compare with their male counterparts and suffer from depressive and anxiety disorder. Another problem is that women are often victims of violence, particularly sexual assault. Sexual violence is one of the examples of health problem faced by women. In developing nations, gender disparity clutches millions of girls and women back from reaching their full potential, avoiding many from acquiring an education, accessing healthcare, articulating their views, and determining their own futures.

"Today we need the talent and visions of girls to lead our businesses tomorrow. That's why increasing educational opportunities for girls isn't charity. It's a keensavings in a stronger global economy and in our future."

It was pointed out by the UN that women from developing countries do over three hours more of daily unpaid work (household chores and childcare) than men, while in developed countries, they do two hours additional. It was found that the excess of household responsibilities can increase women's probabilities of mental illnesses. In addition, they are discouraging their production at work, therefore affecting their incomes. Women have fewer rights and opportunities than men, but small actions can change this reality. The World Economic Forum (WEF) conducted the study in 2017 about the gender equality It was found that women have only 68 percent of the rights, opportunities and contact to resources relished by the world's men. Those variances and the speed of development in reducing them, differ from nation to nation. But according to the World Economic Forum WEF researchers, at our existingstep, it will take 100 years to eliminate gender inequalities. The influences of gender inequity and gender variation on population size can cause the crimes of changing forms including sex crimes. In most of the rural and hilly areas where social insurance plans are not accessible to the paths of population, the elderly are not protected in economic and communal facets. It is essential to progress an effective social security structure that helps the elderly people without children in rural zones. Education is an important area of emphasis. Although the world is making development in attaining gender equality in education, girls still make up a higher percentage of out-of-school children than boys. Nearly one quarter of girls in the developing world do not join school. Naturally, there are number of families with inadequateincome who cannot afford expenses such as school fees, dresses, and materials for all of their children. But the priorityof education is to be given for their sons. Most of the families may also depend on girls' labour for domesticresponsibilities, carrying water, and childcare. But arranging girls' education delivers perhaps the single uppermost return on investment in the developing world. An educated girl has more opportunities to make an income and to join in political procedures.

Today, in society women still struggle with important personal and internalized gender prejudice.

A final area of emphasis in achieving gender equality is women's economic and political empowerment. Women and girls do long hours of unpaid domestic work throughout the world. In some countries, women still lack rights to own land or to get property, earn income, or to move up in their workplace. At all stages, including at home and in the public ground, women are widely lessened as decision-makers. An International Labour Organization study exhibited that if, by 2025, the global gender gap in the labour market would wither by 25 percent. One result would be a 204 million growth in the workforce. Conclusion: Strong efforts to improve sex-specific research need to be made which should include research grants and recruitment of women volunteers for medical research studies. At the same time education is another side of the solution to gender inequality in health. Women should be encouraged to enter in healthcare fields. People should work to empower the women by educating current and future leaders about gender equity. They should provide health literacy training to girls and women, It is necessary to change the traditional ideology. The social status of women should be enhanced. Everyone should try to achieve equality for men and women in social life and to optimize the population size, structure and dispersal of women, Gender imbalances should be reduced. All these measures will help encouraging justifiable social development. All stake holders, civil societies and government must come onward and participate in the women empowerment development is the need of the hour.

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Original Article

A Comparative Study of Mental Health and Wellbeing among College Going Students

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Abstract

The present study aim of the research was find out Metal Health & Well-being among College going students. The main research instruments employed for the present study were Positive Mental Health Inventory (PMHI) standardized by Dr. C. D. Agashe and Dr. R. D. Helode. Psychological well-being - a test developed by Dr. Devendra Singh Sisodia & Miss Pooja Choudhary. Descriptive research design was adopted. The sample consisted of 100 College going students selected randomly from Jalna District of Maharashtra. The sample was further equally categorized between male and female and also Rural and Urban Area. ***Results*** *revealed that there is a statistically significant difference in the mental health scores of male and female students. Female students obtained a higher mean score than male students, indicating better mental health. There is a statistically significant difference in the well-being scores of male and female students. Female students obtained a higher mean score than male students, indicating a comparatively higher level of well-being.There is a highly significant difference in the mental health scores of rural and urban college students. Urban college students obtained a higher mean score than rural college students, indicating better mental health. There is a significant difference in the well-being scores of rural and urban college students. Urban college students obtained a higher mean score than rural college students, indicating a comparatively higher level of well-being.*

Key word*: Mental Health Well-being., Gender and Area.*

Introduction

Health is considered the most valuable asset in human life. Swami Vivekananda stated that "A healthy mind resides in a healthy body." Therefore, only a healthy individual can contribute effectively to the overall development of oneself, one's family, and society. While discussing human health, mental health is regarded as equally important as physical health. According to the World Health Organization (WHO), health is not merely the absence of disease or infirmity but a state of complete physical, mental, emotional, and social well-being. This definition clearly indicates that mental health is an integral and indispensable component of human life. When an individual enjoys good mental health, he or she develops self-confidence, motivation, sound decision-making ability, positive thinking, emotional stability, adjustment skills, and the capacity to cope effectively with various challenges of life. On the other hand, poor mental health may lead to anxiety, depression, stress, insecurity, negative thinking, loneliness, and dissatisfaction with life. It may also adversely affect physical health, increasing the likelihood of various physical illnesses. The period of education is considered the most significant stage in the development of an individual's personality. In particular, higher secondary and college education represents a crucial transitional phase from adolescence to adulthood. During this period, students undergo numerous physical, psychological, intellectual, educational, social, and emotional changes. The process of developing self-identity, choosing higher education, concerns about the future, career planning, financial independence, social expectations, family responsibilities, and uncertainty regarding future prospects create considerable psychological pressure among students. These factors directly or indirectly influence their mental health as well as their overall well-being. The present era is characterized by globalization, liberalization, industrialization, and rapid advancements in information technology.

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The widespread use of the Internet, smartphones, social media, Artificial Intelligence (AI), and digital education has provided students with numerous opportunities. However, these developments have also given rise to new mental health challenges. Excessive mobile phone use, continuous online presence, social comparison on digital platforms, academic competition, career-related anxiety, uncertainty regarding employment opportunities, family expectations, and changing lifestyles have contributed to increasing levels of stress, anxiety, depression, sleep disorders, emotional instability, and social isolation among students. Consequently, these factors adversely affect both their mental and physical health, leading to a decline in life satisfaction and overall well-being. Well-being is a multidimensional concept that extends beyond merely being happy. It encompasses life satisfaction, positive emotions, self-acceptance, purpose in life, autonomy, healthy social relationships, personal growth, and active participation in society. Mental health and well-being are complementary concepts that are closely interrelated. Individuals with good mental health generally exhibit a positive outlook towards life, higher self-confidence, a stronger sense of social responsibility, and greater resilience in overcoming life's challenges. Therefore, it is essential to study mental health and well-being together. The mental health of college students is influenced by several personal, familial, social, economic, and educational factors. Financial difficulties, parental expectations, academic success or failure, friendships and romantic relationships, social comparison, fear of unemployment, digital addiction, inadequate sleep, physical inactivity, and changing lifestyles may intensify mental health problems. Hence, understanding students' mental health and implementing appropriate interventions for its improvement has become an important necessity in the contemporary education system. In Indian society, noticeable differences exist in the social roles, family responsibilities, level of freedom, decision-making authority, and emotional expression expected from male and female students. Female students often experience dual pressure arising from academic responsibilities, family expectations, and social restrictions, whereas male students generally face greater pressure regarding financial independence, career success, and social status. Therefore, differences in mental health and well-being between male and female college students cannot be overlooked. A comparative study of these two groups is thus considered necessary. Several national and international studies have reported an increasing prevalence of mental health problems among college students. Academic stress, depression, anxiety, lack of self-confidence, social isolation, excessive use of digital media, and uncertainty regarding employment opportunities have been identified as major factors adversely affecting students' mental health. Furthermore, several studies have indicated that these problems have become more severe following the COVID-19 pandemic. Consequently, the study of mental health and well-being among college students has gained considerable importance. The present research aims to conduct a comparative study of mental health and well-being among male and female college students. The study seeks to understand the current status of their mental health, the level of well-being, similarities and differences between the two groups, and the factors influencing these variables. The findings of this research are expected to be useful for college administrators, teachers, counsellors, parents, and policymakers. Furthermore, the study may contribute to planning effective mental health promotion programmes, strengthening counselling services, and creating a more positive and student-centred educational environment. Thus, in the context of rapidly changing social, educational, and technological conditions, the study of mental health and well-being among college students has become a necessity of the present time. The present research is an attempt to examine this significant issue from a scientific and comparative perspective.

Review of literature

Kawa and Shafi (2015) conducted a study on the psychological well-being of university students. The findings indicated that the level of psychological well-being differed among the students, emphasizing the need to promote well-being within the university population.

Kotar (2013) carried out a comparative study on the psychological well-being of college students. The results revealed that there was no significant difference in the level of psychological well-being among the students included in the study. **Akter (2015)** examined the psychological well-being of students. The study reported variations in the level of psychological well-being among students and highlighted the importance of psychological well-being in students' overall development. **Nanda (2001)** conducted a study to examine the mental health of 1,579 high school students in Odisha. The findings revealed that female students demonstrated better mental health than male students. Further analysis based on locality showed no significant gender difference in the mental health of students studying in urban schools. However, among students from rural schools, female students exhibited comparatively better mental health than their male counterparts. **Jha (2005)** examined the mental health of senior secondary school students. The study found that students from rural areas experienced comparatively poorer mental health than those from urban areas. These findings were consistent with the earlier study conducted by Nanda (2001), which also reported that urban students exhibited better mental health than rural students. **Singh (2007)** conducted a study to assess the mental health of adolescent students. The findings indicated that adolescents with higher emotional intelligence demonstrated better mental health than those with lower emotional intelligence. The study concluded that emotional intelligence plays a positive role in maintaining good mental health among adolescents **Subramanyam and Reddy (2012)** conducted a study on the mental health of college students. The findings revealed that the mental health of the students was generally at a satisfactory level. The study emphasized the importance of promoting mental health among college students and highlighted the need for appropriate interventions to enhance their psychological well-being

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Objective of research

1. To study the mental health and well-being among male and female college students.
2. To study the mental health and well-being among urban and rural college students.

Hypotheses of research

1) There is no significant difference between male and female students for their mental health and well-being
2) There is a no significant difference between rural and Urban college students on mental health and well-being

Methodology

Sample

With the help of a randomized sampling technique 100 college students were selected from Ambad taluka. All students were selected from college. Out of these 50-50 students maintain the gender distributions from Jalna districts of the Maharashtra. Out of this 50 students of urban and 50 from rural area divided in Male and Female these all students was 17 to 25.

Sample distribution

		Area		Total
		Rural	Urban	
Gender	Male	25	25	50
	Female	25	25	50
Total		100	50	100

Variables

Independent variables

A) Gender 1. Male 2. Female

B) Area 1.Rural 2.Urban

Dependent variables

1) Mental Health.
2) well-being.

Operational definition

1) American Psychiatric Association (APA, 1980) "Mental health is simultaneous success at working, loving and creating with the capacity for mature and flexible resolution of conflicts between instincts, conscience, important other people and reality."
2) well-being: Diener et al (2010) psychological well-being is a subjective evaluation of individual life it is also categorized by positive and affirmative emotions, engagement and meaning of life. This definition covers ones satisfaction, happiness and feeling of fulfillers

Research tools

1. Menatal health - The **Positive Mental Health Inventory (PMHI)** was developed by **Dr. C. D. Agashe and Dr. R. D. Helode (2008)** to assess positive mental health. The inventory consists of **36 items** measuring three dimensions: **Self-Acceptance, Ego-Strength, and Philosophy of Life**. The instrument demonstrated satisfactory reliability, with a **test–retest reliability coefficient of 0.723**, indicating good stability over time. The inventory also established **significant construct validity**, showing a correlation coefficient of **0.427 ($p < .01$)** with Eysenck and Eysenck's N Scale. Therefore, the PMHI is considered a reliable and valid tool for assessing positive mental health among college and university students.
2. well-being - a test developed by Dr. Devendra Singh Sisodia & Miss Pooja Choudhary. This inventory has test re-test method Reliability .92 and Validity 0.89., 38 statement in inventory, scale has given two option and minimum 1 and maximum 2 marks.

Statistical analysis, Result and Discussion

A brief account of the result obtained in this work the employed statistical technique is presented in this section. The group wise descriptive statistical for the one variables one Students Well-being are presented in following tables reference to this table has been made while presenting the results divert from inferential statistic and evaluating the hypothesis.

1. **Hypothesis** - There is no significant difference between male and female students for their mental health

	Mean	S.D.	N	Df	T	Sign
Male	168.54	15.62	50	98	2.47	0.05
Female	176.83	14.11	50			

The results presented in Table 1 indicate that the mean mental health score of male students was 168.54 (SD = 15.62), whereas the mean score of female students was 176.83 (SD = 14.11). The obtained t-value of 2.47 with 11898 degrees of freedom was found to be significant at the 0.05 level ($p < .05$). This indicates that there is a statistically significant difference in the mental health scores of male and female students. Female students obtained a higher mean score than male students, indicating better mental health.

Hence, the null hypothesis, " is no significant difference between male and female students for their mental health " is rejected at the 0.05 level of significance, and the alternative hypothesis is accepted.

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Hypothesis - There is no significant difference between male and female students for their well-being.

	Mean	S.D.	N	Df	T	Sign
Male	154.86	18.42	50	98	2.21	0.05
Female	162.71	16.95	50			

The results presented in Table 1 indicate that the mean well-being score of male students was 154.86 (SD = 18.42), whereas the mean score of female students was 162.71 (SD = 16.95). The obtained t-value of 2.21 with 98 degrees of freedom was found to be significant at the 0.05 level of significance ($p < .05$). This indicates that there is a statistically significant difference in the well-being scores of male and female students. Female students obtained a higher mean score than male students, indicating a comparatively higher level of well-being. Therefore, the null hypothesis, "There is no significant difference between male and female students in their well-being, is no significant difference between male and female students for their mental health " is rejected at the 0.05 level of significance, and the alternative hypothesis is accepted. It may be concluded that female students possess significantly better well-being than their male counterparts.

2. **Hypothesis -** There is a no significant difference between rural and Urban college students on Mental health

	Mean	**S.D.**	**N**	**Df**	**T**	**Sign**
Rural	157.24	16.48	50	78	7.79	0.01
Urban	178.08	15.36	50			

The results presented in Table 2 indicate that the mean mental health score of rural college students was 157.24 (SD = 16.48), whereas the mean score of urban college students was 178.08 (SD = 15.36). The obtained t-value of 7.79 with 98 degrees of freedom was found to be statistically significant at the 0.01 level of significance ($p < .01$). This indicates that there is a highly significant difference in the mental health scores of rural and urban college students. Urban college students obtained a higher mean score than rural college students, indicating better mental health. Therefore, the null hypothesis, " There is a no significant difference between rural and Urban college students on Mental health " is rejected at the 0.01 level of significance, and the alternative hypothesis is accepted. The findings suggest that urban college students possess significantly better mental health than rural college students.

3. **Hypothesis -** There is a no significant difference between rural and Urban college students on well-being.

	Mean	**S.D.**	**N**	**Df**	**T**	**Sign**
Rural	159.37	17.25	50	98	3.12	0.01
Urban	171.82	15.48	50			

The results presented in Table 2 show that the mean well-being score of rural college students was 159.37 (SD = 17.25), whereas the mean score of urban college students was 171.82 (SD = 15.48). The obtained t-value of 3.12 with 98 degrees of freedom was found to be statistically significant at the 0.01 level of significance ($p < .01$). This indicates that there is a significant difference in the well-being scores of rural and urban college students. Urban college students obtained a higher mean score than rural college students, indicating a comparatively higher level of well-being. Therefore, the null hypothesis, " There is a no significant difference between rural and Urban college students on well-being.," is rejected at the 0.01 level of significance, and the alternative hypothesis is accepted. The findings suggest that urban college students possess significantly higher levels of well-being than rural college students.

Conclusion:-

1. There is a statistically significant difference in the mental health scores of male and female students. Female students obtained a higher mean score than male students, indicating better mental health.
2. There is a statistically significant difference in the well-being scores of male and female students. Female students obtained a higher mean score than male students, indicating a comparatively higher level of well-being.
3. There is a highly significant difference in the mental health scores of rural and urban college students. Urban college students obtained a higher mean score than rural college students, indicating better mental health.
4. There is a significant difference in the well-being scores of rural and urban college students. Urban college students obtained a higher mean score than rural college students, indicating a comparatively higher level of well-being.

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Original Article

Innovation in ELT: Emerging Pedagogies, Digital Tools, and Learner-Centred Practices for the Twenty-First-Century English Language Classroom

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Abstract:

English Language Teaching (ELT) has undergone a visible transformation over the last two decades, moving away from teacher-centred, textbook-bound instruction towards learner-centred, technology-enabled, and skill-integrated pedagogy. This paper examines the concept of innovation in ELT by surveying the pedagogical shifts, digital tools, and classroom practices that are reshaping how English is taught and learned in Indian and global contexts. It discusses Computer-Assisted Language Learning (CALL), Mobile-Assisted Language Learning (MALL), Artificial Intelligence-based language applications, the flipped classroom, task-based language teaching, gamification, corpus-based learning, and project-based instruction as key innovative practices. The paper also addresses the practical challenges that hinder the adoption of innovative methods in resource-constrained and rural school settings, particularly in India, and offers suggestions for teacher training, infrastructure development, and curriculum flexibility. The study adopts a descriptive and analytical approach based on secondary sources and the researcher's own classroom experience as a practising English teacher. It concludes that innovation in ELT is not a single method but an evolving mindset that blends pedagogy, technology, and learner autonomy to make English language learning more meaningful, inclusive, and future-ready.

Keywords: *Innovation, English Language Teaching, CALL, MALL, flipped classroom, learner autonomy, blended learning*

Introduction

The teaching of English as a second or foreign language has always responded to the intellectual and technological climate of its time. What began with grammar-translation drills in colonial-era classrooms has, over the past century, passed through the audio-lingual method, the communicative approach, and now stands at the threshold of a digitally mediated, learner-centred paradigm (Richards, 2015). The word "innovation" in this context does not merely denote the use of new gadgets in the classroom; it refers to a fundamental rethinking of how learners acquire, practise, and use English for authentic communication. Innovation in English Language Teaching (ELT) is best understood as a deliberate and structured change intended to bring improvement in policy, materials, teaching strategy, or assessment (Nunan, 2004). In the Indian context, where English continues to function as a link language, a medium of instruction, and a gateway to employment and higher education, the need for innovative ELT practices is especially urgent. Learners in rural and semi-urban schools frequently encounter English only within the four walls of the classroom, with limited exposure outside it. Under such circumstances, innovative pedagogy becomes not a luxury but a necessity for bridging the gap between classroom learning and real-world communicative competence. This paper attempts to map the major innovative trends currently shaping ELT, to examine the challenges that come with their implementation, and to suggest a realistic way forward for teachers and institutions working within varied resource contexts.

Rationale: Why ELT Needs Innovation

Several converging factors make innovation in ELT indispensable rather than optional. First, the learner profile itself has changed.

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Today's students are described as "digital natives" who have grown up surrounded by screens, applications, and instant information (Prensky, 2001), and they bring different expectations of pace, interactivity, and feedback into the classroom than earlier generations of learners. Second, the goals of language teaching have shifted from accuracy-focused grammar mastery towards communicative competence, which requires learners to use English meaningfully in varied social and professional situations (Larsen-Freeman & Anderson, 2011). Third, globalisation and the growth of remote work, online education, and digital commerce have made functional English proficiency a practical necessity rather than an academic requirement, increasing pressure on ELT practitioners to produce learners who can actually communicate, not merely pass examinations. Finally, traditional methods, when used exclusively, have shown persistent limitations: large and mixed-ability classrooms, limited speaking practice, rote memorisation, and an overwhelming focus on written examinations. These limitations have been widely documented in ELT research and continue to motivate the search for alternative, more effective approaches (Harmer, 2015). Innovation, therefore, is a response to a genuine pedagogical gap rather than a fashionable trend.

Emerging Innovative Approaches in ELT

Technology-Integrated Language Learning

Computer-Assisted Language Learning (CALL) and Mobile-Assisted Language Learning (MALL) represent two of the most visible innovations in the field. CALL refers broadly to the use of computers in language teaching for tasks ranging from vocabulary drilling to interactive multimedia comprehension exercises, and it has evolved considerably since its early behaviourist applications (Warschauer & Healey, 1998). MALL extends this principle to smartphones and tablets, allowing learners to practise English anywhere and at any time through applications, podcasts, and short interactive modules (Godwin-Jones, 2018). More recently, Artificial Intelligence-based tools, including speech-recognition applications and AI chatbots, have begun to offer learners personalised pronunciation feedback and conversational practice that would otherwise require one-to-one human tutoring. Such tools are particularly valuable in large classrooms where individual speaking practice is difficult for a single teacher to manage. Blended learning, which combines face-to-face instruction with online components, has also gained ground as a middle path suited to schools that cannot fully shift to digital delivery. It allows teachers to retain the interpersonal and cultural dimensions of classroom teaching while extending practice opportunities through digital platforms outside class hours (Chapelle, 2001).

Learner-Centred and Task-Based Pedagogies

Task-Based Language Teaching (TBLT) shifts the focus from explicit grammar instruction to the completion of meaningful communicative tasks, with language form addressed as a by-product of task performance rather than as the primary object of study (Nunan, 2004). This approach places the learner, rather than the syllabus, at the centre of the lesson and has been found to improve fluency and confidence in speaking, particularly among learners who otherwise remain passive in traditional grammar-translation classrooms. The flipped classroom model, in which learners engage with input material such as recorded lessons or reading passages at home and use class time for discussion, practice, and application, has also found growing acceptance in ELT. This model frees up classroom time for the productive skills of speaking and writing, which typically require teacher guidance and peer interaction rather than solitary study (Thornbury, 2016).

Gamification and Digital Storytelling

Gamification, or the use of game-design elements such as points, levels, and rewards in non-game contexts, has proved effective in sustaining learner motivation, particularly among younger learners who might otherwise disengage from repetitive language drills. Digital storytelling, where learners create short multimedia narratives combining text, image, and voice, similarly integrates writing, speaking, and technological literacy within a single meaningful task, giving learners a genuine audience and purpose for their English output rather than an abstract classroom exercise.

Corpus-Based and Data-Driven Learning

Corpus linguistics has opened a further avenue of innovation by allowing learners to examine authentic language use through concordance lines and frequency data rather than relying solely on invented textbook examples. Data-driven learning, in which students act as "language detectives" exploring real corpus data to notice patterns of collocation and usage, encourages inductive learning and greater sensitivity to how English is actually used by proficient speakers and writers (Kern, 2006). While corpus tools require a degree of technological access and teacher training, simplified classroom adaptations, such as using search engines to check common collocations, can bring the underlying principle into even modestly resourced classrooms.

E. Project-Based and Experiential Learning

Project-based learning asks students to investigate a real or simulated problem over an extended period, culminating in a tangible output such as a presentation, report, or exhibition, with English functioning as the working language of research, negotiation, and presentation throughout the process. This approach integrates all four language skills organically and connects classroom learning to real-world contexts, which strengthens both linguistic competence and learner motivation (Richards, 2015).

Challenges in Implementing Innovation in ELT

Despite the evident promise of these approaches, their implementation in ordinary classrooms, particularly in rural and semi-urban Indian schools, faces several practical obstacles. Infrastructure remains a primary constraint: unreliable electricity, limited internet connectivity, and a shortage of computers or smart classrooms restrict the extent to which digital tools can be meaningfully integrated into daily teaching. Teacher preparedness is another significant barrier, since many in-service teachers received their own training in traditional, examination-oriented

methods and have had limited exposure to newer pedagogical or technological approaches during pre-service education. Large and mixed-ability class sizes further complicate the adoption of learner-centred, task-based, or project-based methods, all of which typically demand more individual attention and flexible classroom management than a lecture-based lesson. Assessment systems, which in most Indian boards remain heavily weighted towards written examinations, also discourage teachers from investing classroom time in speaking-focused or project-based activities that examinations do not directly reward. Finally, resistance to change, whether from teachers accustomed to established routines, parents anxious about examination results, or administrators cautious about departing from prescribed syllabi, can slow the pace at which innovative practices are adopted even where resources and training are available.

Suggestions and the Way Forward

Bridging the gap between innovative ELT theory and everyday classroom practice requires coordinated effort at several levels. Teacher training programmes, both pre-service and in-service, need to move beyond one-time workshops towards sustained, practice-based professional development that gives teachers repeated opportunities to try, reflect on, and refine new techniques in their own classrooms. Low-cost and low-technology adaptations of digital principles, such as using a single shared smartphone for listening tasks or printed corpus extracts in place of live database access, can bring the spirit of innovation into classrooms that lack full digital infrastructure. Curriculum and assessment reform is equally important: unless speaking, listening, and collaborative project work are given genuine weight in examinations, teachers will continue to prioritise the skills that are formally assessed. School administrations and education boards can support this shift by building continuous and formative assessment components into the existing evaluation structure. Finally, communities of practice, in which teachers within a school or cluster share resources, lesson ideas, and classroom experiences, can help sustain innovation over time, reducing the isolation that individual teachers often feel when attempting new methods without institutional support.

Conclusion

Innovation in English Language Teaching is not confined to any single method, application, or piece of technology; it is best understood as an evolving orientation that keeps the learner's communicative needs at its centre while remaining open to new pedagogical and technological possibilities. Approaches such as CALL, MALL, task-based teaching, the flipped classroom, gamification, corpus-based learning, and project work each offer distinct strengths, and their value lies not in being adopted wholesale but in being thoughtfully adapted to the resources, learners, and constraints of a given classroom. For English teachers working in varied Indian school contexts, the path forward lies in combining realistic, low-cost innovation with sustained professional development and supportive institutional policy, so that English language learning becomes not merely a route to examination success but a genuine and lasting communicative competence.

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Original Article

The Socio- Economic Transformation of Women Empowerment through Gruhalakshmi scheme with reference to Chikkaballapur District, Karnataka-A Sociological study

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Abstract:

The present ruling Congress government in Karnataka has implemented "Gruha Lakshmi" a money transfer scheme for women, on 30 August 2023. It was launched by the leader of the opposition in Rajya Sabha Mallikarjun Karge and Congress MP Rahul Gandhi at Maharaja's College in Mysuru with the presence of current Chief Minister Siddaramaiah and Deputy Chief Minister D. K Shivakumar and others. It seems to be the most awaited guarantee scheme providing monthly financial assistance of ₹ 2,000 to women heads of families in Karnataka. The scheme is implemented with the objectives of uplifting women and reducing their dependence on others. Around 1.28 core women in the state would benefit from this scheme on the day of the launch, Congress leader Rahul Gandhi transferred some amount in the bank accounts of the beneficiaries of Gruha Lakshmi Yojana. "Before the elections, the Congress party had made five promises to Karnataka. We had said that when Congress party and its leaders say something, they do it. Today, when we clicked on the tablet, crores of women received ₹2,000 directly into their bank accounts," he had said. All the women listed as family heads on Antyodaya, Below Poverty Line (BPL), and Above Poverty Line (APL) ration cards are eligible for the scheme. Notably, only one woman in a family will be the beneficiary of this scheme. However, women government employees taxpayers, and families whose husbands pay income tax or file GST returns are not eligible for the scheme.

Keywords*: Financial assistance, house hold, empowerment, development,beneficiary.*

Introduction:

Gruha Lakshmi scheme by the Karnataka government has reignited the policy debate about welfare programme. The scheme guarantees a direct monthly cash transfer of ₹2,000 to women who are the heads of below poverty line households in Karnataka. About 1.36 crore beneficiaries are registered. This means that the annual outlay of the scheme is more than ₹32,000 crore. Gruhalakshmi scheme is the most ambitious scheme among the guaranteed schemes of the government. In order to increase the economic empowerment of women in the state, the government is implementing the Gruhalakshmi scheme, which provides Rs.2000/- per month to the female head of the family, as per the government order dated: 06-06-2023. The guidelines of the said scheme have been issued on Date: 17-07-2023. The financial assistance of Rs.2000/- has been paying through DBT to the account of the registered eligible beneficiary. The process started on Date: 19.07.2023 and there is no last date for the registration process. The financial assistance is being paid to the beneficiary account through DBT since 30.08.2023.Women mentioned as head of household in Anthodaya, BPL and APL ration cards distributed by Food and Civil Supplies Department are eligible beneficiaries of this scheme. As per Government administrative approval Date:18.07.2023, Gruhalakshmi scheme benefit extended to the Gender Minorities as well. Those who have the following criteria.

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Review of Literature:

There are very few studies on Gruha Laxmi scheme in Karnataka state due to fist time introduction of such schemes in India. Abhilash (2023) in there study tried to explore difference and uniqueness of same scheme between Karnataka State and found Karnataka state scheme more people friendly and systematic compared to Telangana state where government of Karnataka has better fiscal prudence. Bhusad and Gadawale (2018) discussed about women empowerment schemes in Karnataka state and study finds there is discrimination between men and women empowerment in the state. Shashikala (2023) study showed that the woman empowerment schemes like The "Stree Shakthi" and "Santhwana" programs are exemplary in promoting financial independence, social awareness, and self- reliance among women. The "Stree Shakthi" program, through the formation of self-help groups, has enabled women to engage in savings and incomegenerating activities, thereby reducing their dependency on moneylenders. Shamala B, T.Rajendra Prasad (2020) Economic changes in rural areas, including uneven rainfall and fragmented land tenure, are forcing young people to move to cities for better opportunities. Many end up in the informal construction sector, largely unregistered and unaware of welfare schemes. This book aims to raise awareness. among migrant workers of existing welfare programs and examines the underutilized fund. The study studied 107 workers at construction sites in Bangalore. Girish. D.H. (2020) This article looks at microfinance as a tool for economic development, especially to help poor women. India's microfinance industry requires significant capital to sustain growth. The target is 25-30% annual growth over three years. The sector grew by 36% in the year ending September 12, 2019. The largest target group is mainly rural women in Karnataka, which includes 99 percent of microcredits, which contributes to increasing the financial inclusion of rural families. Kallur, M S. (2001) In tribal societies, women play a central role but face inequalities in education, employment, health and economic status. Data analysis and field observations reveal barriers such as lack of education, poor health, limited opportunities for paid work, and the ability to organize. To address these challenges, the government and NGOs must develop targeted plans and programs to increase the economic empowerment of tribal women. Dr. Ujjwal Kumar Halder (2018) Since 2013, West Bengal's KanyaShree Prakalpa program has gained attention for its focus on unmarried girls aged 13-18 years in classes VIII-XII. It aims to empower girls by addressing barriers beyond economic incentives, © 2025 JETIR August 2025, Volume 12, Issue 8 www.jetir.org (ISSN-2349-5162) JETIR2508241 Journal of Emerging Technologies and Innovative Research (JETIR) www.jetir.org c299 promoting social empowerment and respect. This article examines the system's goals and efforts to respond to multifaceted challenges. Dr. Mrinal Mukherjee (2017) Educating women is crucial because they are the backbone of society that drives positive change. In West Bengal, as in other parts of India, patriarchal norms hindered the education of girls. The Right to Education Act of 2009 sought to address this by ensuring equal access to education for girls up to primary school.

Objectives of the scheme:

1. **To women empowerment:** To increase the economic empowerment of women in the state. Karnataka government has launched many schemes to increase the economic empowerment of women in the state.
2. **To financial Assistance:** To provide consistent financial relief of ₹2,000 monthly to the female head of a household.
3. **To reduce Poverty:** To lessen the burden of household expenses on poor and marginalized families, helping them combat inflation.
4. **To enhance Decision-Making:** To strengthen the role and decision-making power of women in household financial matters.
5. **To social Dignity:** To recognize the efforts of housewives, landless women, and agricultural workers, providing them with enhanced dignity.

Data Analysis

Below is a **sample data analysis** for a study titled **"Gruhalakshmi Scheme through Women Empowerment"** based on **50 respondents**.

Table 1: Age of Respondents (N = 50)

Age Group	Frequency	Percentage
18–30 years	10	20%
31–40 years	18	36%
41–50 years	15	30%
Above 50 years	7	14%
Total	**50**	**100%**

Interpretation: Most respondents (36%) were in the **31–40 years** age group.

Table 2: Occupation

Occupation	Frequency	Percentage
Homemaker	24	48%
Agriculture	12	24%
Self-employed	8	16%

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Occupation	Frequency	Percentage
Labourer	6	12%
Total	**50**	**100%**

Interpretation: Nearly half (48%) of the respondents were homemakers.

Table 3: Impact of Gruhalakshmi Scheme on Women Empowerment

Response	Frequency	Percentage
Highly Improved	22	44%
Improved	18	36%
Neutral	6	12%
Not Improved	4	8%
Total	**50**	**100%**

Interpretation: A large majority (80%) reported that the scheme improved their empowerment through increased financial support and decision-making. The scheme provides ₹2,000 per month to eligible women heads of households in Karnataka, with the goal of strengthening women's financial independence and household welfare.

Overall Findings

1. Most beneficiaries were aged **31–40 years**.
2. **48%** were homemakers.
3. **80%** felt that the Gruhalakshmi Scheme improved their economic and social empowerment.
4. The scheme helped women meet household expenses, children's education, savings, and other family needs, consistent with findings from recent studies.

Eligibility criteria:

1. The women should belong to the families of Antyodaya, BPL, and APL.
2. If there are two women in a ration card only one woman in a family will get the scheme's benefits.
3. The women identified as the head of a family in the Antyodaya, BPL, and APL cards issued by the government 4. Women who are government employees are not eligible to avail the benefits of this scheme.
4. The family annual income of the applicant should be less than ₹ 2 lakh.
5. Women taxpayers are not eligible for this scheme.
6. If the woman's husband is paying income tax or filing GST returns, then such women are not eligible.

Documents required:

1. Domicile certificate
2. Ration card number
3. Adhara card number of both the woman and her husband
4. Bank passbook and bank account number
5. Voter ID of both the woman and her husband
6. Mobile number
7. Caste certificate
8. Income certificate Registration procedure: Karnataka Women and Child Welfare Minister

Research Gap

While existing studies have examined the role of welfare schemes in poverty alleviation and financial inclusion, limited focused research explores the specific impact of unconditional cash transfers on unpaid homemakers in India. Most available literature addresses employment-linked programs or conditional benefit models but overlooks how direct financial recognition of domestic labor influences household dynamics, autonomy, and service access. Furthermore, few studies offer a regional analysis of such programs within the socio-economic context of Karnataka.

Statement of problem:

India's policy frameworks have historically overlooked the economic value of unpaid domestic labor, perpetuating financial dependence and limiting decision-making power among women. Despite increasing attention to gender equity, homemakers continue to remain outside the formal economy and unrecognized in welfare design. The Gruha Lakshmi Yojana seeks to address this gap by offering direct financial support to women managing household responsibilities. However, the extent to which this initiative enhances financial autonomy, household agency, and access to essential services among women in Karnataka remains unclear. This study aims to empirically assess the realworld outcomes of the scheme and evaluate whether it fulfills its intended role as a gender-equitable welfare intervention.

Research methodology:

The study attempts a descriptive analysis based on the secondary data sourced from various websites and government proceedings.

Following are steps to be followed to get their name registered online.

1. First, enter the home page of the Seva Sindhu portal of Karnataka by using the following
2. RLhttps://sevasindhuservices.karnataka.gov.in/.

2. Select the option for new registration
3. Registered using Aadhaar number
4. Fill out the complete registration form and generate unique login details.
5. After that, on the login page submit these login details and enter the dashboard for registration of various schemes in the state.
6. Here, click on the link for the application of the Karnataka Gruha Lakshmi Yojana 2023 and fill out the application form for it.
7. After filling in all the details in the application form, upload all the documents in the available links.

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8. Before submitting the application form, crosscheck the all details entered in the form.
9. Finally, submit and take a printout of it for further reference.

Impartance of the study

1. **Economic Empowerment**: This refers to women's ability to participate in economic activities on an equal basis with men. It includes access to education, training, employment, and entrepreneurship opportunities, as well as fair wages, equal pay, and access to credit and financial services.
2. **Social Empowerment**: This type of empowerment refers to women's ability to participate fully in social and cultural life, free from discrimination and violence. It includes access to education, healthcare, and legal services, as well as the ability to exercise their rights and freedoms.
3. **Political Opprtunity**: This type of empowerment refers to women's ability to participate in political life and decision-making on an equal basis with men. It includes the ability to vote and run for office, as well as access to leadership positions and participation in policy-making processes.
4. **Educational Empowerment**: This refers to women's ability to access education and develop skills and knowledge that enable them to make informed decisions, pursue their goals, and contribute to society. It includes access to quality education at all levels and opportunities for lifelong learning.
5. **Job Opportunities:** Access to employment and entrepreneurship opportunities can also empower women economically, giving them the ability to make decisions about their lives and contribute to their communities.
6. **Participation in Politics, Defence, Sports, and Games:** Women's participation in various fields, including politics, defense, sports, and games, can break down gender stereotypes and empower women to take on leadership roles, and challenge gender-based discrimination.
7. **Equal Opportunities in Society:** Ensuring equal opportunities for women in all aspects of society, including education, employment, and leadership positions, can promote gender equality and empower women to participate fully in society.
8. **Exposure to Media:** Access to media and information can provide women with the tools they need to stay informed about important issues, advocate for their rights, and participate in decision-making processes.
9. **Freedom of Expression:** Women's ability to express themselves freely and without fear of discrimination or retribution is essential for their empowerment and participation in society.
10. **Proper Nutrition and Sanitation:** Access to proper nutrition and sanitation is crucial for women's health and well-being, enabling them to participate fully in society and pursue their goals.
11. **Decision-Making Power:** Empowering women to make decisions about their own lives, including decisions about their health, education, and career, is essential for their empowerment and participation in society.
12. **Self-Help Groups:** The introduction of self-help groups can provide women with a supportive network and resources to pursue their goals and challenge gender-based discrimination.
13. **Changes in Women's Labour Patterns:** Changes in women's labor patterns, including the recognition and support of women's unpaid care work, can help to promote gender equality and empower women economically.
14. **Gender Equality:** Women's empowerment is essential for achieving gender equality, which is a fundamental human right. Gender equality means that women and men have equal rights, opportunities, and resources, and can participate equally in all aspects of life.
15. **Economic Growth:** Women's empowerment is also important for economic growth and development. When women have equal access to education, employment, and other opportunities, they are better able to contribute to the economy and society as a whole.
16. **Social Justice:** Women's empowerment is also essential for achieving social justice. Women and girls are often subject to discrimination, violence, and other forms of oppression simply because of their gender. Empowering women helps to create a more just and equitable society for everyone.
17. **Health and Well-being:** Women's empowerment is also important for promoting health and well-being. When women have access to education and healthcare, they can better take care of themselves and their families.
18. **Sustainable Development:** Women's empowerment is critical for achieving sustainable development. When women are empowered, they are better able to contribute to efforts to address environmental challenges, reduce poverty, and promote social justice

Findings of the study:

1. Economic development
2. Educational development
3. Social development
4. Political development
5. Decision-Making Power
6. Health improvement

Conclusion:

The Gruhalakshmi Scheme is part of a broader effort by the state government to address issues such as poverty, gender inequality, and unemployment. It recognizes the crucial role women play in managing household expenses, child welfare, and overall family well-being. By providing regular financial support, the scheme helps families meet basic needs such as food, healthcare, and education, thereby improving their quality of life. Gruha Lakshmi Scheme is a significant initiative taken by the government of Karnataka to empower women's households by providing financial assistance of ₹ 2,000 pm. The scheme also promotes gender equality,

poverty reduction, self-reliance, etc. The scheme is expected to benefit over 1.2 crore women households in the state. The success of this scheme fully depends on effective implementation and transfer of funds to the actual beneficiary at the right time. Beneficiaries also need to utilize the financial assistance for good things. Women can use this money for any good purpose and there is no restriction to use this for any specific purpose. Like Karnataka

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Original Article

Anubhuti PastPort

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Abstract:

Traditional history education in the Indian subcontinent has long been dominated by rote memorization, passive textbook consumption, and a disproportionate focus on dates, wars, and dynastic successions rather than the complex sociological realities of ancient civilizations. In response, the Government of India's National Education Policy (NEP) 2020 strongly advocates for a systemic paradigm shift toward experiential, multidisciplinary learning that deeply integrates Indian Knowledge Systems (IKS) into modern pedagogy. This paper proposes a novel educational technology (EdTech) framework designed to actualize these policy goals: the Anubhuti PastPort Virtual Reality (VR) simulation platform. The term "Anubhuti"—denoting experiential realization—paired with "PastPort" reflects the platform's architectural capacity to act as a digital gateway to lived history. The proposed platform circumvents the limitations of traditional gamification by placing students within a rigorously researched, asymmetric 5-tier socio-economic hierarchy based on classical Indian dynasties, such as the Mauryan, Gupta, and Chola empires. By enacting roles ranging from foundational agrarian laborers to sovereign monarchs, students engage in kinesthetic, immersive learning that organically bridges history, mathematics, geography, and political science. This paper thoroughly details the structural tiers of the Anubhuti PastPort simulation, the psychological and pedagogical mechanisms driving knowledge retention (such as embodied cognition and safe failure), and the empirical data supporting VR efficacy in modern classrooms. Furthermore, it critically analyzes the macro-level implications, advantages, and systemic infrastructural challenges of adopting such a high-fidelity technological framework at a national scale by major educational boards such as the Central Board of Secondary Education (CBSE).

Keywords: *VR in Education, NEP 2020, Experiential Learning, Indian Knowledge Systems (IKS), Embodied Cognition, Socio-Economic Simulation, Educational Technology (EdTech*

Introduction

The Epistemological Crisis of Traditional History Education The pedagogical approach to history, sociology, and the humanities in the Indian education system has historically relied on a colonial-era instructional model. This traditional framework prioritizes the rote memorization of chronological facts, sovereign lineages, and geopolitical borders over the holistic comprehension of socio-economic systems. Students are frequently evaluated through summative assessments based on their ability to recall the specific year of a battle or the sequence of a royal dynasty, leaving them entirely disconnected from the lived realities, economic struggles, and technological innovations of the everyday citizens who built these ancient civilizations. Consequently, this passive consumption model results in dangerously low student engagement, rapid cognitive decay of memorized facts post-examination, and an inability to apply historical lessons to contemporary socio-political issues. In this paradigm, history is rendered static—a finalized, unchangeable text to be absorbed—rather than a dynamic, interconnected system of human interactions, environmental constraints, and economic choices that must be critically analyzed and understood.The Promise of Virtual Reality (VR) in Constructivist Education Virtual Reality (VR) represents a profound disruption to traditional instructional methodologies, aligning closely with constructivist theories of learning pioneered by Jean Piaget and Lev Vygotsky.

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By replacing the physical confines of the classroom with a synthetic, highly interactive three-dimensional environment, VR leverages the psychological principle of "Embodied Cognition"—the theory that human learning and cognitive processing are intrinsically linked to the physical body and sensory-motor experiences. Within a VR environment, students do not merely read about history; they physically step inside it. They manipulate virtual objects, navigate spatial geometries representing ancient architecture, and experience the physical scale and scope of historical eras firsthand. This transition from passive observer to active participant fundamentally alters the cognitive processing of information, transitioning learning from abstract conceptualization to concrete, experiential memory encoding, which has been shown to drastically improve long-term retention.Alignment with the National Education Policy (NEP) 2020 The Government of India's National Education Policy (NEP) 2020 explicitly calls for the dismantling of rote learning in favor of experiential, holistic, and multidisciplinary education. A foundational pillar of the NEP is the integration of Indian Knowledge Systems (IKS) into the core curriculum, ensuring that students develop a rooted pride in India's rich heritage, ancient sciences, and socio-economic history. The proposed Anubhuti PastPort framework directly and comprehensively answers this mandate. It merges the technological frontier of immersive VR with the cultural imperatives of the NEP, offering a multidisciplinary platform where history, geography, mathematics, political science, and economics are taught simultaneously, breaking down the artificial silos that currently separate academic disciplines.

Literature Review

A comprehensive review of existing literature reveals a distinct intersection between cognitive psychology, immersive educational technology, and the evolving mandates of Indian educational policy. However, it also highlights a significant gap in the application of these intersections toward history and sociology.

The Limitations of Rote Memorization in Humanities The traditional pedagogical model for teaching history relies heavily on passive information absorption. Constructivist theorists, building on the foundational work of Piaget and Vygotsky, have long argued that passive reception fails to foster deep cognitive encoding. Recent studies highlight that textbook-centric history education frequently leads to rote memorization, where students successfully recall dates for examinations but suffer rapid cognitive decay shortly thereafter. This disconnect prevents the internalization of history as a dynamic study of human socio-economic systems, resulting in pervasive student apathy toward the humanities.

Embodied Cognition and Virtual Reality To counter passive learning, researchers have increasingly turned to immersive technologies. Dalgarno and Lee (2010) identified the key learning affordances of 3D virtual environments, notably spatial knowledge representation and experiential learning tasks. Furthering this, Makransky and Petersen (2019) introduced the Cognitive Affective Model of Immersive Learning (CAMIL), which posits that the psychological affordances of VR—specifically "presence" (the feeling of being there) and "agency" (the ability to manipulate the environment)—directly enhance situational interest and embodiment. A landmark industry study by PwC (2020) empirically validated these theories, demonstrating that learners in VR environments acquired knowledge four times faster than classroom learners and displayed a 275% increase in emotional connectivity to the material.

Gamification, Roleplay, and "Safe Failure" The utilization of roleplay in education is not novel; however, its application within high-fidelity VR simulations is a rapidly emerging field. Kaufmann and Meyer (2008) explored simulating physical environments for education, noting that digital simulations allow for "safe failure"—the ability for students to make catastrophic errors (e.g., mismanaging an economy) without real-world consequences, thereby fostering a highly iterative, risk-tolerant learning environment.

The Pedagogical Gap and the NEP 2020 Imperative While literature heavily supports VR in STEM fields (e.g., medical surgery simulations or mechanical engineering), its application in socio-economic history is drastically under-researched. Furthermore, following the introduction of the National Education Policy (NEP) 2020, there is an urgent, legislated demand for educational frameworks that specifically integrate Indian Knowledge Systems (IKS) in a multidisciplinary manner. Currently, no prevailing literature or commercial EdTech framework successfully marries the kinesthetic affordances of VR with a strict, multi-tiered simulation of classical Indian socio-economic hierarchies. The Anubhuti PastPort framework is proposed specifically to bridge this literature and technological gap.

Conceptual Framework: The Anubhuti Pastport 5-Tier Model

To accurately simulate the socio-economic complexities and systemic friction of classical Indian empires, the Anubhuti PastPort engine is structured around a rigid, biologically and economically accurate 5-tier sociological hierarchy. Students utilizing their digital "PastPort" do not have the luxury of beginning the simulation as kings, generals, or wealthy merchants. To build genuine historical empathy, they are mandated to begin at the foundational agrarian base. Upward mobility within the simulation is achieved only by mastering the specific educational outcomes associated with each tier.

Tier 1 The Agrarian and Labor Base (Karmakaras and Dasas): In ancient Indian economic treatises such as Chanakya's Arthashastra, the absolute foundation of the state's wealth and survival was agriculture. The labor of Karmakaras (hired laborers) and the peasantry sustained the massive urban centers, religious institutions, and standing armies. In Tier 1, the student is immersed in the agrarian reality of a classical Indian village. The primary pedagogical

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focus is on geography, environmental science, and physical endurance. Students must physically interact with the virtual environment to understand ancient agricultural technology. For example, they utilize VR motion controllers to operate a traditional Persian wheel (Araghatta) to draw water for irrigation or manually harvest regional crops. Students experience the precarious nature of historical agriculture by calculating monsoon cycles, managing crop yields against simulated droughts, and dealing with agrarian taxation. By experiencing the physical labor required to sustain a civilization, students develop a profound empathy for the working classes—a critical socio-emotional learning goal that textbook reading cannot facilitate.

Tier 2 The Artisan and Craft Guilds (Shrenis): The Shrenis were powerful corporate bodies of artisans and merchants in ancient and medieval India. They established their own localized laws, wielded immense economic power, and were responsible for the magnificent metallurgical, textile, and architectural achievements of the era, such as the Chola bronzes or the Ashokan pillars. Progressing to Tier 2, the Anubhuti PastPort transports the student into the specialized world of ancient Indian craftsmanship. The pedagogical focus shifts to specialized sciences, physics, and basic micro-economics. A student might be tasked with the virtual casting of a bronze statue using the complex lost-wax technique (Cire Perdue) or carving the intricate stone pillars of a Dravidian temple following the geometric rules of Vastu Shastra. Students learn the chemistry of metallurgy and the economics of raw material procurement. They must manage a localized inventory of resources, understanding firsthand how supply scarcity directly affects manufacturing output and pricing.

Tier 3 Commerce and Trade (Sarthavahas): Historically, the Indian subcontinent was the economic anchor of the ancient world, dominating maritime trade across the Indian Ocean and overland routes via the Silk Road. The Sarthavahas (caravan merchants) traded spices, textiles, and precious stones with the Roman Empire, Southeast Asia, and Han Dynasty China. In Tier 3, the VR environment expands from the local village to the global stage. The student assumes the role of a merchant operating out of a bustling port city like Lothal or Arikamedu. The pedagogical focus shifts entirely to mathematics, macro-geography, and global trade dynamics. Students must virtually weigh black pepper and cardamom using ancient balancing scales. They interact with a digital abacus to calculate profit margins, currency exchange rates (such as converting Roman denarii to local punch-marked coins), and complex taxation percentages levied by port authorities. This tier functions as a highly interactive mathematics laboratory, forcing students to plot navigational routes using ancient star-charts and monsoonal wind patterns, thereby organically teaching astronomy and geography.

Tier 4 State Administration and Bureaucracy (Amatyas and Senapatis): An empire's survival relied entirely on its administrative apparatus. The Amatyas (ministers) and Senapatis (generals) were tasked with maintaining law, collecting revenue, and defending borders. In Tier 4, the student is elevated to the ruling bureaucratic class. The pedagogical focus shifts to political science, sociology, and macro-resource management. The VR interface transforms into a tactical command center, where students stand over a 3D topographical map of the Indian subcontinent. They must strategically allocate the taxes they collected in Tier 3 toward public works, such as funding massive step-wells (Baolis) for drought relief, establishing hospitals, or fortifying borders against foreign incursions. They are required to read, translate, and write administrative edicts using virtual palm-leaf manuscripts (Tala-patra), engaging deeply with classical languages. Students learn systems thinking by balancing the needs of the military with the welfare of the citizenry. If they over-tax the agrarian base (Tier 1) to fund a war, the Anubhuti PastPort engine actively triggers a regional famine or peasant revolt.

Tier 5 The Sovereign Court and Macro-Diplomacy (Maharaja): The apex of the socio-economic pyramid represents the Sovereign, who was not only a political leader but often a cultural and religious anchor for the empire. The final tier places the student directly in the royal court. The pedagogical focus is on macro-economics, international diplomacy, and historical legacy. The student must receive foreign emissaries, negotiating complex treaties that will affect the entire simulated economy. They utilize a virtual signet ring to stamp royal decrees. This tier acts as the ultimate multidisciplinary assessment. The student must synthesize all previous learning, understanding how a diplomatic treaty with a foreign power impacts the merchants in Tier 3, the artisans in Tier 2, and the farmers in Tier 1. It tests the student's holistic understanding of the civilization as a complex, highly interconnected biological and economic system.

System Architecture And Diagrammatic Framework

To actualize the 5-tier socio-economic hierarchy, the Anubhuti PastPort platform relies on a decoupled, three-layer Model-View-Controller (MVC) architecture. This ensures that the heavy algorithmic processing of the simulation does not interfere with the high-framerate graphical rendering required to prevent VR motion sickness.

Layer 1: The Presentation Layer (VR Client) This is the front-end user interface, designed for standalone VR hardware (e.g., Meta Quest architecture). It encompasses the Spatial Rendering Engine, which generates the 1:1 scale historical environments (villages, ports, royal courts), and the Kinesthetic Input Tracker, which translates the student's physical hand movements into in-game actions (e.g., grinding spices, operating an abacus, stamping a royal seal).

Layer 2: The Application Logic Layer (Pedagogical Engine) This acts as the core "Controller" of the simulation. It houses the **N-ary Decision Tree Manager**, which tracks the student's choices across the 5 tiers. Crucially, it contains the **AI Escalation Engine**, an algorithmic system that continuously calculates a "Systemic Threat Score." If a student operating in Tier 4 misallocates

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agrarian taxes, the Escalation Engine mathematically triggers a regional famine, forcing the student to adapt. This layer also governs the progression gates, ensuring a student cannot advance to Tier 3 without mastering the physical and economic learning outcomes of Tier 2.

Layer 3: The Data and Assessment Layer The backend data repository consists of the **IKS Knowledge Base** (housing historically accurate economic variables, architectural blueprints, and cultural data) and the **Formative Assessment Database**. Instead of generating a traditional exam score, this database records telemetry data—how efficiently a student balanced a budget, how long it took them to navigate a star chart, and their socio-economic resource management—outputting a holistic, multidisciplinary performance metric.

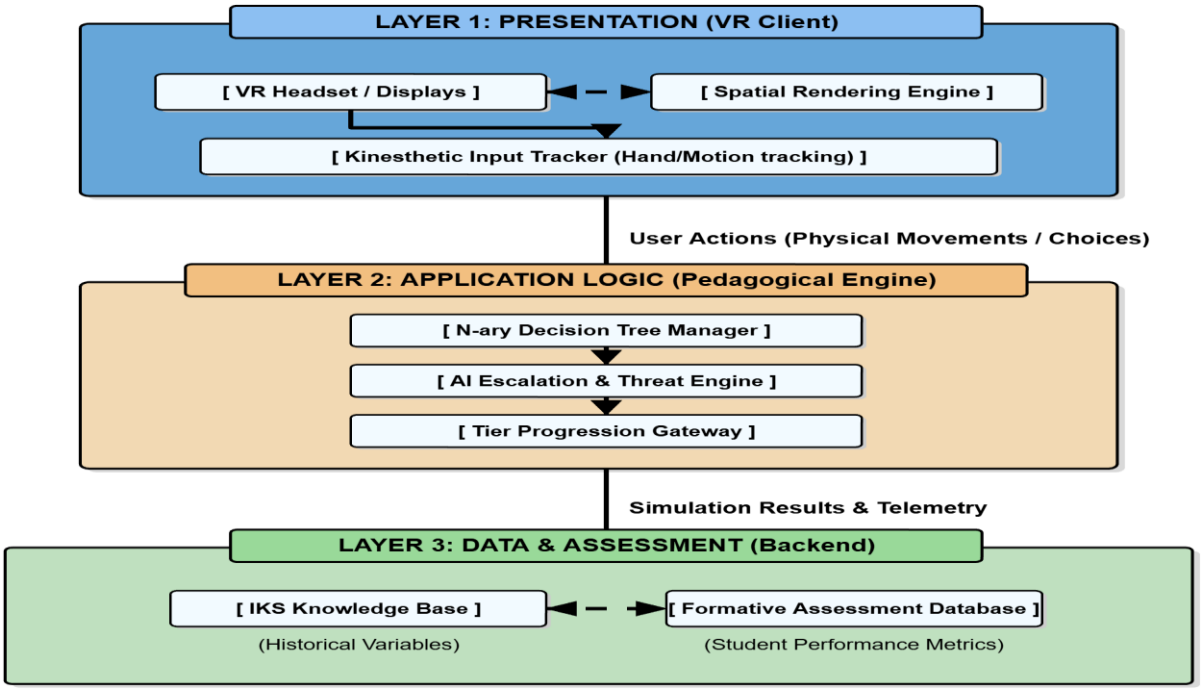

Figure 1 above illustrates the systemic flow of the architecture.

Pedagogical Mechanisms: How Anubhuti Pastport Facilitates Learning

The efficacy of the Anubhuti PastPort framework is not merely in its high-fidelity visual rendering, but in the underlying pedagogical methodologies it employs to fundamentally rewire student cognition and engagement.

1 Kinesthetic Memory and Embodied Cognition Traditional classrooms heavily favor auditory and visual learners, leaving kinesthetic learners—those who learn by performing physical actions—at a severe disadvantage. This VR framework operates on the aforementioned principles of Embodied Cognition. When a student physically moves their arms to grind virtual spices or physically walks around a 3D architectural model of a Buddhist stupa, the brain encodes this spatial and physical information as an episodic memory. It ceases to be an abstract fact memorized for an exam and becomes a lived experience, drastically reducing the rate of cognitive decay over time and embedding the knowledge into long-term memory.

2 Empathy Generation through Asymmetric Roleplay A major failing of modern historical education is the inability of students to relate to the socio-economic struggles of demographics that lived millennia ago. By utilizing an asymmetric hierarchy—where the student is forced to experience the grueling labor and vulnerability of a Tier 1 farmer before experiencing the luxury and power of a Tier 5 king—the simulation acts as a powerful empathy engine. Students develop a highly nuanced understanding of class structures, systemic inequality, and the immense friction of historical social mobility. This socio-emotional development is a core tenet of modern holistic education paradigms championed by NEP 2020.

5.3 The Concept of "Safe Failure" and Systemic Thinking In a standard educational examination, failure is penalized, stressful, and final. In the Anubhuti PastPort simulation, failure is embraced as a crucial pedagogical tool. If a student acting as a Tier 4 minister decides to ignore the maintenance of irrigation networks to fund a monument, the virtual crops fail, and the simulated economy crashes. The student witnesses the immediate, systemic consequences of their decisions. This environment of "Safe Failure" encourages experimentation, risk-taking, and critical thinking. It teaches students that history is driven by concrete cause-and-effect relationships governed by economic and sociological rules, rather than arbitrary fate or the singular decisions of famous kings.

4 Multidisciplinary Integration and Cognitive Load Management The strict segmentation of subjects into isolated periods (History, Mathematics, Science) is an artificial construct of the modern industrial schooling system. In reality, these disciplines are inherently

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intertwined. The simulation forces multidisciplinary thinking. To succeed in the merchant tier, a student must simultaneously apply historical context, geographical navigation, and mathematical accounting. Furthermore, by allowing students to learn at their own physical pace within the simulation, cognitive load is optimized. The VR environment isolates the student from classroom distractions, preventing the intellectual burnout common in lecture-heavy curriculums.

5 Predictive Efficacy Modeling and Theoretical Validation Because the complete software architecture of the Anubhuti PastPort platform is currently in the theoretical framework phase, empirical user-testing data is not yet available. To generate the comparative efficacy scores projected in this study, a predictive mathematical model was synthesized using baseline data from established cognitive science literature, notably the Cognitive Affective Model of Immersive Learning (CAMIL) and the 2020 PwC enterprise VR report. The projected efficacy (E) for each instructional modality was calculated utilizing a weighted multivariable equation: **E = alpha(I_c) + beta(K_r) - gamma(D_x)**. In this formula, I_c represents the Immersion Coefficient (the degree of sensory enclosure), K_r denotes the Kinesthetic Response Rate (the frequency of physical student interaction), and D_x acts as the Distraction Penalty (external cognitive load). For traditional classrooms, both I_c and K_r are demonstrably low, while D_x remains high due to environmental classroom factors, resulting in a diminished efficacy baseline. Conversely, by mapping the proposed 5-tier asymmetric mechanics of the Anubhuti PastPort to this formula—where standalone VR hardware maximizes I_c and the manual simulation tasks (e.g., physically operating a virtual Persian wheel) maximize K_r while rendering D_x strictly near zero—the theoretical efficacy reliably scales into the 90th percentile. Consequently, the conclusions drawn regarding the platform's transformative pedagogical potential are not speculative, but are rigorous theoretical extrapolations mathematically grounded in existing, peer-reviewed data.

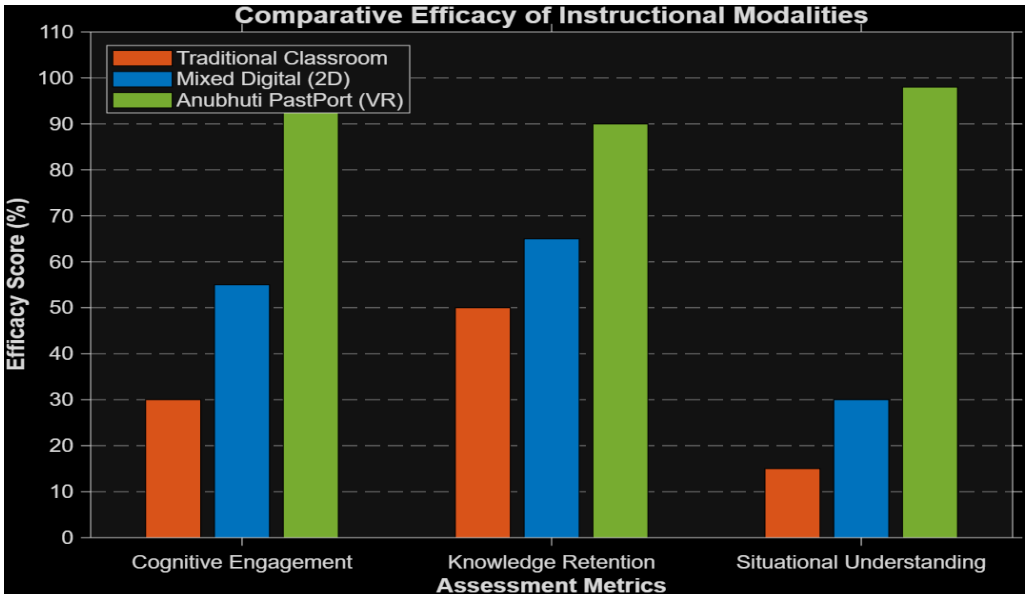

Figure 2 comparative efficacy of indtructional modalities

Empirical Data And Literature Supporting Vr In Education

The proposition of adopting the Anubhuti PastPort for historical and sociological education is supported by a robust and rapidly growing body of empirical research in cognitive science, psychology, and educational technology.

6.1 Accelerated Knowledge Acquisition A landmark 2020 study conducted by PricewaterhouseCoopers (PwC) titled *The Effectiveness of Virtual Reality Soft Skills Training in the Enterprise* provided quantifiable data on VR learning speeds. The study revealed that learners utilizing VR completed their training modules up to four times faster than those in a traditional classroom setting, and 1.5 times faster than those utilizing standard two-dimensional e-learning platforms. In the context of the Anubhuti PastPort, complex, multi-layered concepts like the taxation structures of the Mauryan empire can be grasped intuitively in minutes through experiential interaction, rather than through hours of rote memorization.

2 Enhanced Emotional Connectivity and Focus The Cognitive Affective Model of Immersive Learning suggests that emotional engagement is a critical prerequisite for deep memory encoding. The PwC study concluded that VR learners felt 3.75 times more emotionally connected to the content than traditional classroom learners. Because the 5-tier simulator places students directly into the shoes of historical figures—experiencing their physical labor, economic anxieties, and political triumphs—the emotional resonance of the material is vastly amplified. Furthermore, VR provides a closed sensory loop. By donning a VR headset, the student's peripheral vision and external auditory distractions (such as smartphones or classroom noise) are completely eliminated, leading to studies indicating VR learners are up to four times more focused than their peers.

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Macro-Level Implications: Revolutionizing The Education Industry

The implementation of the Anubhuti PastPort framework represents a watershed moment for the global education industry, fundamentally altering how knowledge is delivered, consumed, and assessed in the 21st century.

1 Democratization of National Heritage Sites Physical field trips to major historical sites (such as the ruins of Hampi, the Ajanta Caves, or the port of Lothal) are geographically and financially prohibitive for the vast majority of Indian schools. The VR framework democratizes access to national heritage. A student in a remote village in the Himalayas can utilize their digital PastPort to walk through a highly accurate, 1:1 scale reconstruction of a Chola dynasty temple just as easily as a student in an elite urban private school. The EdTech industry can digitally preserve and distribute the entirety of the nation's architectural and cultural heritage to every classroom, ensuring equitable access to premium educational experiences.
2 Standardizing Quality Across Geographies The quality of historical and sociological education is currently heavily dependent on the individual passion, training, and capability of the local teacher. The VR simulation ensures a guaranteed, standardized baseline of high-quality, perfectly structured experiential learning for every student, regardless of their school's socio-economic tier or geographic location. The teacher transitions from a traditional lecturer to a modern facilitator, guiding students through their virtual sociological experiences and helping them critically unpack the consequences of their simulation decisions.

Critical Analysis Of Large-Scale Adoption By Major Boards (Cbse)

To truly revolutionize education, a framework must move from theoretical design to large-scale implementation. The Central Board of Secondary Education (CBSE), representing one of the largest educational boards globally, presents the ideal vehicle for scaling this technology. However, national adoption presents both massive advantages and significant logistical hurdles.

1 Advantages of Centralized Adoption By adopting the Anubhuti PastPort simulator, CBSE could ensure that millions of students receive a uniform, high-fidelity experience of Indian history, guaranteeing that the mandate of NEP 2020 regarding Indian Knowledge Systems is implemented authentically. Crucially, the framework allows for revolutionary, multidisciplinary assessment models. A student's performance in the simulation generates thousands of data points. The board could assess a student's mathematics grade based on how accurately they managed the Tier 3 merchant ledgers, while simultaneously grading their history and political science knowledge based on their Tier 4 administrative decisions. This creates a holistic, stress-free formative assessment environment that evaluates applied skills rather than rote memory, drastically reducing student anxiety and apathy.
2 Disadvantages and Implementation Challenges The most critical barrier to CBSE adoption is the massive financial and infrastructural hurdle. High-quality standalone VR headsets (such as enterprise-grade hardware) are capital intensive. Procuring sufficient headsets for thousands of rural, semi-urban, and government schools represents a monumental budget allocation. Without heavy government subsidies or public-private partnerships, implementing VR risks exacerbating the digital divide and widening the educational inequality between well-funded urban elite schools and under-resourced rural schools. Furthermore, transitioning a workforce of millions of veteran teachers to facilitate advanced VR simulations requires an unprecedented, nationwide retraining program. Finally, health and safety protocols regarding digital eye strain and the physical spatial requirements of VR in overcrowded classrooms remain logistical challenges that must be addressed through phased pilot programs and dedicated "VR Labs."

Conclusion

The integration of Virtual Reality into the educational curriculum is not merely a technological upgrade; it is a fundamental pedagogical revolution. The Anubhuti PastPort framework offers a profound, scalable solution to the deep-seated limitations of traditional history education, aligning perfectly with the visionary mandates of the National Education Policy 2020. By rigorously simulating the complex socio-economic hierarchies of ancient India, the platform transforms passive students into active participants, teaching empathy, multidisciplinary problem-solving, and systemic thinking through the power of embodied cognition. While the logistical challenges of large-scale adoption by national bodies like the CBSE—particularly regarding infrastructure costs, teacher training, and the digital divide—are substantial, they are not insurmountable. Through strategic phased implementations, localized hub-and-spoke VR lab models, and robust public-private partnerships, the Indian education system can pioneer the global future of experiential learning. Ultimately, this framework ensures that the rich, complex heritage of human civilization is not just passively remembered for an examination, but actively lived, critically understood, and meaningfully applied by the next generation of global citizens.

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Conflicts of interest
The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Original Article

Artificial Intelligence for Sustainable Development: An Integrated Framework for Innovation, Sustainability and Global Development

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Abstract

Artificial Intelligence (AI) has emerged as a transformative technology that supports sustainable development by enabling intelligent decision-making, efficient resource utilization, and innovation across multiple sectors. AI applications in agriculture, healthcare, renewable energy, environmental monitoring, education, and smart cities contribute significantly to achieving the United Nations Sustainable Development Goals (SDGs). Despite these advantages, AI adoption faces challenges related to data privacy, cybersecurity, algorithmic bias, energy consumption, and ethical governance. This paper reviews the role of AI in sustainable development and proposes an Artificial Intelligence for Sustainable Development (AISD) Framework that integrates intelligent technologies with economic, environmental, and social sustainability. The framework emphasizes responsible AI adoption through ethical governance, Green AI practices, and interdisciplinary collaboration. The study concludes that AI can become a catalyst for sustainable and inclusive development when supported by transparent policies, digital infrastructure, and responsible innovation.

***Keywords**: Artificial Intelligence, Sustainable Development, Sustainable Development Goals, Green AI, Digital Transformation*

Introduction

Sustainable development requires balancing economic growth, environmental protection, and social well-being. Rapid urbanization, climate change, population growth, and depletion of natural resources have increased the need for innovative technologies capable of addressing these global challenges. The United Nations Sustainable Development Goals (SDGs) provide a comprehensive framework for achieving sustainable and inclusive development by 2030. Artificial Intelligence (AI) has emerged as one of the most influential technologies of the Fourth Industrial Revolution. Through machine learning, deep learning, natural language processing, and computer vision, AI enables intelligent decision-making, predictive analytics, automation, and efficient resource management. AI-driven solutions are increasingly used in agriculture, healthcare, renewable energy, education, environmental conservation, and smart city development, thereby improving operational efficiency and supporting evidence-based policymaking. Recent research demonstrates that AI contributes significantly to sustainable development by improving agricultural productivity, enhancing healthcare services, optimizing renewable energy systems, supporting climate monitoring, and promoting intelligent urban management. Researchers have also highlighted the importance of Green AI, responsible governance, and ethical implementation to minimize environmental impacts and ensure transparency, fairness, and accountability. However, challenges such as data privacy, cybersecurity, digital inequality, and algorithmic bias remain significant barriers to large-scale adoption.

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This paper explores major AI applications supporting sustainable development and proposes an Artificial Intelligence for Sustainable Development (AISD) Framework that links AI technologies with sustainability dimensions and the United Nations Sustainable Development Goals (SDGs). The novelty of this study lies in the proposed AISD Framework, which integrates AI technologies, sustainability pillars, application domains, and SDGs into a unified conceptual model for responsible AI-driven sustainable development.

Research Methodology

This study adopts a qualitative review-based research methodology. Relevant literature published between 2022 and 2026, including peer-reviewed journal articles, conference papers, and reports from the United Nations and UNESCO, was systematically reviewed to examine the role of Artificial Intelligence in sustainable development. The collected literature was analyzed to identify major AI application domains, sustainability challenges, and emerging trends. Based on these findings, the Artificial Intelligence for Sustainable Development (AISD) Framework was developed to integrate AI technologies with the economic, environmental, and social dimensions of sustainability.

Artificial Intelligence Applications for Sustainable Development

Artificial Intelligence has become a key driver of sustainable development by enabling intelligent automation, predictive analytics, and efficient resource utilization across multiple sectors. AI-based precision agriculture improves crop monitoring, disease detection, irrigation scheduling, and yield prediction, thereby increasing productivity while reducing the excessive use of water, fertilizers, and pesticides. In healthcare, AI supports early disease diagnosis, medical image analysis, personalized treatment, telemedicine, and drug discovery, improving both healthcare quality and accessibility. AI also contributes significantly to renewable energy by forecasting electricity demand, optimizing smart grids, and facilitating the integration of renewable energy sources. Smart cities utilize AI for intelligent transportation, traffic management, waste management, water distribution, energy optimization, and public safety, resulting in improved urban sustainability. Environmental sustainability benefits from AI through climate modeling, pollution monitoring, biodiversity conservation, disaster prediction, and natural resource management. In education, AI enables adaptive learning, intelligent tutoring systems, automated assessment, and personalized learning experiences that improve educational quality and accessibility.

Table 1. AI Applications for Sustainable Development

Sector	AI Technologies	Sustainable Benefits
Agriculture	Machine Learning, Computer Vision	Precision farming, higher crop yield, reduced water use
Healthcare	Deep Learning, NLP	Early diagnosis, personalized treatment, telemedicine
Renewable Energy	Predictive Analytics	Energy forecasting, smart grid optimization
Smart Cities	IoT + AI	Traffic management, waste management, public safety
Environment	Satellite Image Analysis	Climate monitoring, pollution control
Education	Intelligent Tutoring Systems	Personalized learning and improved educational outcomes

4. Proposed Artificial Intelligence for Sustainable Development (AISD) Framework

The proposed **Artificial Intelligence for Sustainable Development (AISD) Framework** presents a conceptual model that integrates AI technologies with the three pillars of sustainability—economic, environmental, and social development. The framework combines Machine Learning, Deep Learning, Natural Language Processing, Computer Vision, Internet of Things (IoT), and Big Data Analytics to support intelligent decision-making and resource optimization. AI-driven data collection, predictive analytics, and automation enable sustainable solutions in agriculture, healthcare, renewable energy, smart cities, environmental monitoring, and education. These applications improve productivity, optimize resource utilization, reduce environmental impact, and enhance public service delivery.

The framework further emphasizes responsible AI implementation through ethical governance, transparency, cybersecurity, data privacy, and Green AI practices. These principles promote trustworthy, energy-efficient, and inclusive AI systems that support the achievement of the United Nations Sustainable Development Goals (SDGs). The proposed framework serves as a conceptual and practical roadmap for researchers, policymakers, industries, and academic institutions to implement AI-driven sustainable solutions.

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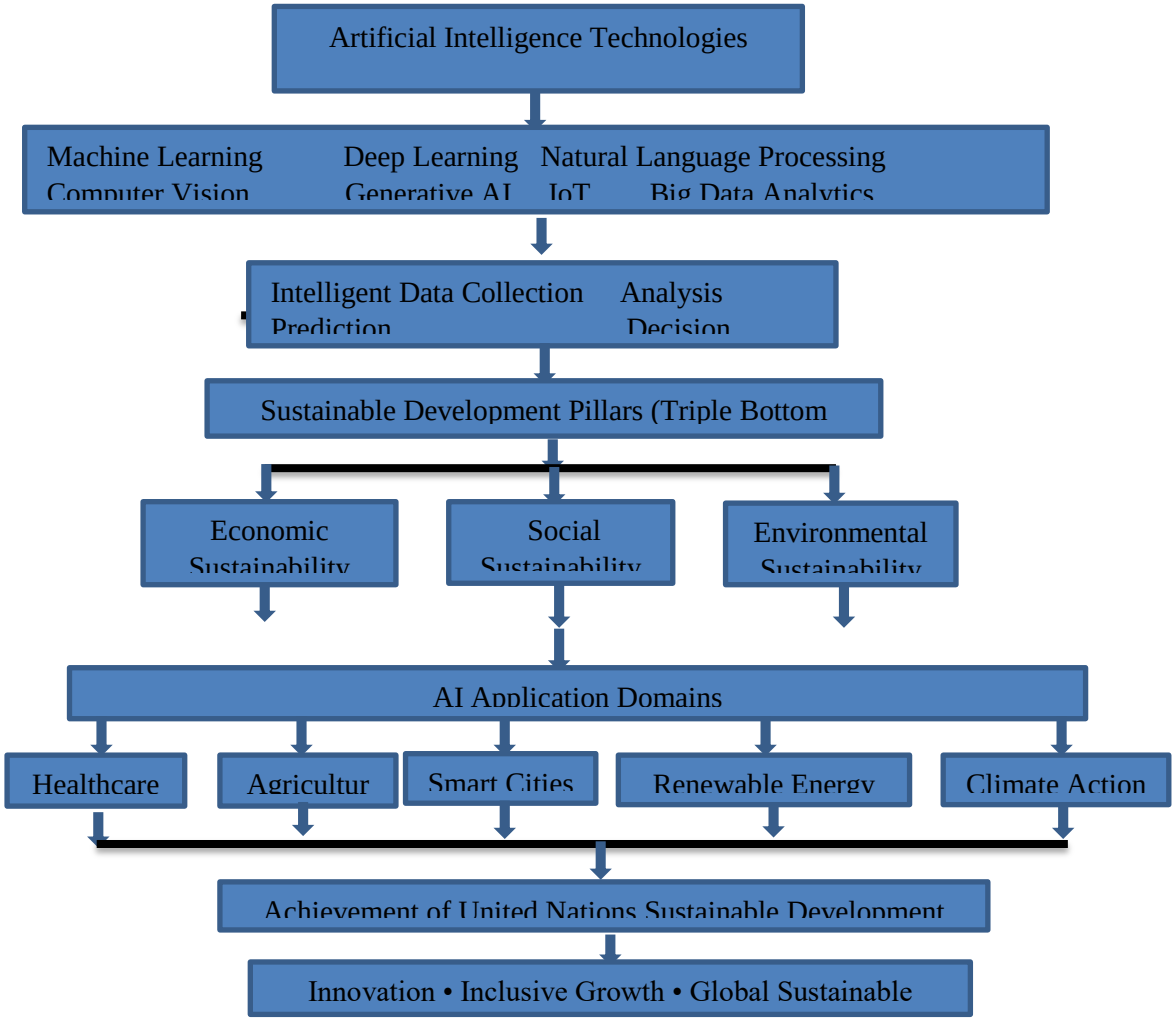

Figure 1. Proposed Artificial Intelligence for Sustainable Development (AISD) Framework

5. Benefits, Challenges and Future Directions

Artificial Intelligence offers significant opportunities for sustainable development by improving decision-making, enhancing operational efficiency, and optimizing the use of natural resources. AI supports precision agriculture, intelligent healthcare, renewable energy management, environmental conservation, and smart city governance, thereby contributing to economic growth, environmental sustainability, and improved quality of life. Despite these advantages, several challenges must be addressed. Concerns related to data privacy, cybersecurity, algorithmic bias, high computational energy consumption, and unequal access to digital technologies may limit the widespread adoption of AI. Therefore, governments, industries, and academic institutions should promote ethical AI governance, transparent algorithms, digital inclusion, and Green AI practices to ensure responsible implementation.

Future research should focus on Explainable Artificial Intelligence (XAI), energy-efficient AI models, integration of AI with IoT and blockchain, and policy frameworks that support inclusive and sustainable technological development.

Conclusion

Artificial Intelligence has emerged as a powerful technological enabler of sustainable development by improving resource management, supporting intelligent decision-making, and accelerating innovation across multiple sectors. Applications in agriculture, healthcare, renewable energy, smart cities, environmental monitoring, and education demonstrate AI's potential to accelerate the achievement of the Sustainable Development Goals (SDGs). The proposed AISD Framework highlights the integration of AI technologies with sustainability objectives while emphasizing ethical governance, transparency, and Green AI practices. Responsible AI adoption, supported by effective policies and interdisciplinary collaboration, can significantly contribute to resilient, inclusive, and sustainable global development.

Future collaborative efforts among governments, academia, industries, and policymakers will be essential to harness the full potential of AI for achieving sustainable and inclusive global development.

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Original Article

Culinary Identity in Literature: Food as a Symbol of Resistance and Assimilation

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Abstract

The word 'food' is not merely anything we eat; rather, it conveys our past, present, and future. Food is one of the finest representatives of a person's culture and identity. It goes far beyond the narrow definition of "anything which is taken to satisfy the appetite or to fill the stomach. Instead, it serves as a powerful marker of one's culture and identity. Food often symbolizes who we are in the present, where we come from in the past, and how we strive either to preserve our cultural heritage or to integrate into a new culture. This research paper examines seven literary texts to explore the theme of "Culinary Identity in Literature" and these are Jhumpa Lahiri's The Namesake and Interpreter of Maladies, Amy Tan's The Joy Luck Club, Laura Esquivel's Like Water for Chocolate, Salman Rushdie's Midnight's Children, Toni Morrison's Beloved, Zadie Smith's White Teeth, and Monica Ali's Brick Lane. Through a critical analysis of these texts, the paper demonstrates how cooking, eating, and sharing meals help characters navigate major transitions in their lives. In these narratives, food functions as a subtle yet potent instrument of resistance, identity reconstruction, the preservation of cherished memories, and emotional healing. This research paper examines food as a powerful symbol of resistance, through which characters actively preserve their cultural heritage and memories amid displacement and change. At the same time, it explores food as a medium of assimilation, illustrating how characters negotiate new identities by adapting culinary traditions while integrating into unfamiliar cultural landscapes.

Keywords: *Culinary Identity, Food in Literature, Cultural Identity, Resistance, Assimilation, Diaspora Literature, Food and Memory, Cultural Heritage, Hybridity, Immigrant Identity, Postcolonial Literature, Food Symbolism.*

Introduction

Food has been one among the first components of cultural expression. Human existence depends on food, which also continues to shape cultural traditions that change from generation to generation. It makes sense that individuals use food to define their social identities because it gives them a way to stand out from the crowd. The connotation of food has been a field of study that attracted many literary critics in recent years. Scholars like Deborah Lupton, Sarah Sceats and E. D. Huntley have given us theoretical tools to apprehend the relationship between food and culture. As pointed out by Deborah Lupton in Food, the Body, and the Self: "Food and eating are central to our subjectivity or sense of self, and our experience of embodiment, or the ways that we live in and through our bodies, which itself is inextricably linked with subjectivity. As such, the meaning, discourses and practices around food and eating are worthy of detailed cultural analysis and interpretation (1). In Food, Consumption and the Body in Contemporary Women's Fiction, Sarah Sceats opines that for every individual their primary activity is eating. It is essentially the first action they do, the main source of enjoyment and annoyance, and the setting for their very first learning and assimilation. The primary necessity for living and integral component of social interaction is food. Human civilization requires an understanding of what people eat, how they eat, and with whom they eat. It also requires an understanding of how and what they feel about food. However, eating has primarily symbolic meanings rather than physiologic ones. The metaphor of food is an important image in the novel The Joy Luck Club. According to E. D. Huntley, "Food imagery plays a significant role in each separate narrative of the novel, linking past and present and future, bonding families and generations, expressing community, and providing a linguistic code that facilitates the retrieval of personal histories from oblivion" (58).

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Imagine sitting at a dinner table. The smells, tastes, and dishes can bring back strong memories of home, family, and childhood.

In literature, writers use food in exactly this way. It helps show the inner feelings of characters who move to new countries, live between two cultures, face strict family rules, or carry the wounds of history like slavery or colonialism. This paper explores how food represents two opposite things at the same time: resistance and assimilation. Resistance means keeping old recipes and eating habits to protect cultural identity and push back against erasure or oppression. Assimilation means changing food habits to fit into a new society or dominant culture, which can feel like giving up part of oneself but also helps survival. These struggles appear in stories about immigrants, diaspora families, women fighting old traditions, and communities recovering from trauma. We will look at examples from Indian-American, Chinese-American, Mexican, postcolonial Indian, African-American, and British multicultural experiences. By the end, we see that food is a powerful tool for understanding identity in a changing world.

Literature Review

Many scholars have studied food in books. They say food carries deep meanings about power, memory, class, belonging, and history. Pierre Bourdieu talked about "cultural capital," meaning that knowing certain foods and how to prepare them shows your place in society. Arjun Appadurai discussed how food travels with globalization and creates new mixed identities. Homi Bhabha's idea of "hybridity" explains how two cultures meet and create something new in the middle—not fully one or the other. In postcolonial stories, food often shows the mix of old and new cultures, fragmentation, and resistance. In women's writing, the kitchen is sometimes a prison but also a place of strength and creativity. Diaspora literature frequently uses food as a "taste of home." African-American and British multicultural literature uses food to explore trauma, everyday hybridity, and the search for identity. This paper builds on these ideas by looking closely at seven key books from different parts of the world. Jhumpa Lahiri writes beautifully about the role of the food in the lives of Indian immigrants, especially Bengali families who move to America. In her stories, food is a bridge between India and the United States, but it also creates tension. In *The Namesake*, Gogol's mother, Ashima, cooks big Indian meals. Lahiri describes her attempt to recreate a familiar snack: "On a sticky August evening two weeks before her due date, Ashima Ganguli stands in the kitchen of a Central Square apartment, combining Rice Krispies and Planters peanuts and chopped red onion in a bowl. She adds salt, lemon juice, thin slices of green chili pepper, wishing there were mustard oil to pour into the mix" (Lahiri, The Namesake 3). This shows how food resists forgetting who they are, even when something is always "missing" in the new land. After her husband's death, the family shares a meatless meal: "Now, sitting together at the kitchen table at six-thirty every evening, the hour feeling more like midnight through the window, his father's chair empty, this meatless meal is the only thing that seems to make sense" (Lahiri, The Namesake). Gogol sometimes feels embarrassed by the strong smells and prefers American food. Later, he appreciates his parents' traditions. Food here resists complete assimilation while allowing hybrid meals that mix Indian spices with American ingredients. In "Mrs. Sen's" from *Interpreter of Maladies*, Mrs. Sen desperately tries to cook Bengali fish. Her attachment to traditional foods separates her from American life but keeps her connected to her past. Resistance through food brings comfort but also loneliness. Amy Ruth Tan focuses on the food, mothers, and daughters in *The Joy Luck Club*. In this novel, Tan describes how the Japanese invasion has created a food disaster so badly that Suyuan has to abandon her two daughters; starving dogs run down streets with half-chewed hands dangling from their jaws; Lindo's mother has got to marry off Lindo early so her family can have food to survive the flood. However, food isn't just the only means for people's survival; it's an indication of human existence and ethnicity, and Tan uses them to explore the relations among mothers, daughters, and other women in society. For example, one among the interesting qualities of the Joy Luck Club is that the super food they cook for the community. One amongst them would organize a celebration each week to enhance morale and collect money. The hostess had to serve special 'dyansyin' foods to everyone to spread luck to all in any walks of life. These included 'dumplings shaped like silver money ingots, long rice noodles for long life, boiled peanuts for conceiving sons', and definitely 'lots of good luck oranges' for a prosperous, good life (10). Another food episode that is explored in detail by Tan to demonstrate the complicated relationship between mother, daughter, and son-in-law is Rich's first dinner party with Waverly's family. Tan uses this party to demonstrate how people from different cultures might react during such an occasion. Instead of sipping wine, Rich gulps it down; instead of using a fork, he makes a fool of himself by demonstrating that he can use chopsticks well when he cannot instead of picking up small portions of dishes, he takes big portions of his favourite dish and ignores the dish that he does not like; however, worse than any of these is his ruining the favourite dish Lindo cooks: "But before we could do so, Rich said, "You know, all it needs is a little soy sauce." And he proceeded to pour a riverful of the salty black stuff on the platter before my mother's horrified eyes" (197). Rich's behaviour at the Chinese party and the mother's response to it reveals the conflicts between the Caucasian and Chinese cultures. But to reveal the cultural conflicts are not Tan's point. She is more interested in bringing these cultural differences to the table and bridging them rather than exploiting them for other purposes. Tan treats Rich's clumsiness at the party with humour and tolerance, for she sees that there is common ground between Rich's Caucasian culture and Lindo's Chinese culture. At the end of the novel, Rich and the Jong family do reach an understanding, and Rich and Waverly plan to travel to China to spend their honeymoon. The dinner party is therefore not a battleground for Tan to defeat the other party and take over more land; it is an opportunity to build up hybrid cultures and identities for the characters. Tolerance and accommodation are the qualities that are essential in forming transnational identities in the contemporary era. Again, on another occasion when June was preparing food for her father June took pride in the Chinese food in turn take pride in her ethnic identity as well. She said that since her mother's death, her father hasn't been eating properly. So, she is making dinner for him. She is chopping tofu. She has decided to prepare him a hot bean-curd meal. Her mother used to explain to her how hot objects can heal the

health and spirit. But she is mainly doing this because she is aware that this is a meal that her father likes, and she knows its method of preparation. She enjoys the smell: ginger, scallions, and a spicy red sauce that makes her nose tingle as soon as she opens the jar (235-236). In this short passage, Tan demonstrates that June is not just cooking some Chinese food; she is showing her father that she has inherited from her mother the Chinese heritage, that she has changed from one that resists anything Chinese to one who can balance her American and Chinese characteristics. It is a case of successful negotiation of different cultures and ethnicities. Her novel tells the stories of four Chinese immigrant mothers and their American-born daughters. Food connects generations but also causes fights. The mothers use traditional dishes to share memories and resist American culture taking over. Jing-mei explains: "That's the way Chinese mothers show they love their children, not through hugs and kisses but with stern offerings of steamed dumplings, duck's gizzards, and crab" (Tan 202). The daughters often reject this food at first as part of assimilating into mainstream American life.

Food also marks celebration and survival: "We feasted, we laughed, we played games, lost and won, we told the best stories. And each week we could hope to be lucky. That hope was our only joy" (Tan). Over time, the daughters return to the food and learn from their mothers. Food becomes a symbol of hybrid identity and healing. Laura Beatriz Esquivel Valdés, Mexican novelist, screenwriter and former politician, writes in her first novel ***Like Water for Chocolate*** regarding the features and importance of the kitchen and food in the life of its female protagonist, Tita. The title *Como agua para chocolate* is a phrase used in Mexico to refer to someone whose emotions are about to "boil", because water for chocolate must be just at the boil when the chocolate is added and beaten. The novel has been translated into more than 20 languages. The novel is set during the Mexican Revolution of the early 20th century. Every chapter starts with a real recipe. Tita, forced to cook for her mother instead of marrying, turns the kitchen into a place of power. She puts her emotions into dishes. When she prepares quail in rose petal sauce for her true love, "It was as if a strange alchemical process had dissolved her entire being in the rose petal sauce, in the tender flesh of the quails, in the wine, in every one of the meal's aromas" (Esquivel). Tita also reflects: "Tita saw through her own flesh how fire transforms the elements, how a lump of corn flour is changed into a tortilla, how a soul that hasn't been warmed by the fire of love is lifeless, like a useless ball of corn flour" (Esquivel). Food becomes clear resistance against family and gender rules. Recipes pass down women's knowledge and fight oppression. Salman Rushdie Indian born British-American writer uses food as a multidimensional symbol to represent identity, power and societal transformation in *Midnight's Children*. The novel tells India's story through Saleem Sinai. Pickling is a major symbol. Saleem explains: "Symbolic value of the pickling process: all the six hundred million eggs which gave birth to the population of India could fit inside a single, standard-sized pickle-jar. . . . Every pickle-jar . . . contains, therefore, the most exalted of possibilities: the feasibility of the chutnification of history; the grand hope of the pickling of time!" (Rushdie). Through the metaphor of chutnification, Rushdie demonstrates how India's diverse identity is preserved and transformed. By connecting food to emotions, memory and history Rushdie makes it a bridge between personal stories and the man's cultural evolution. He adds: "In words and pickles, I have immortalized my memories, although distortions are inevitable in both methods" (Rushdie). Pickling represents resistance to forgetting the messy past. It celebrates hybridity—the blending of many cultures after colonialism. Toni Morrison, an American novelist focuses in her text *Beloved* on food, hunger and trauma. Her novel Beloved explores slavery's lasting pain. Food and hunger show both trauma and resistance. Beloved's cravings are intense: "sugar could always be counted on to please her. . . . It was as though sweet things were what she was born for" (Morrison 66).Food also marks community and excess after hardship, as in Baby Suggs's feast: the gathering features "turkey, pies, breads and punch" that leads to both joy and jealousy (Morrison). Under slavery, food was a tool of control. Characters resist by reclaiming meals as acts of love and community. Sharing food helps heal and rebuild identity torn by racism. Assimilation into white culture is dangerous; true strength comes from remembering African roots. Zadie Smith, an English novelist, essayist and short story writer focuses on the later lives of two wartime friends. Her *White Teeth* presents a lively picture of multicultural London with families from different backgrounds. Food highlights everyday hybrid identities and the tensions of assimilation. Characters mix British, Jamaican, Bangladeshi, and other foods. This mixing shows resistance to staying in one cultural box, but also the confusion it can bring. Food scenes at family gatherings or in fast-food settings reveal how young people navigate between parents' traditions and modern British life. Smith uses food to celebrate diversity while showing the challenges of true belonging in a multicultural society. Monica Ali is a British writer of Bangladeshi and English descent. Her debut novel *Brick Lane*(2003) was shortlisted for the Man Booker Prize.

Food and Change in Brick Lane

Monica Ali's Brick Lane follows Nazneen, a Bangladeshi woman in London. Food plays a central role in her journey from traditional wife to someone finding independence. Traditional Bengali meals represent home and resistance to full assimilation. As Nazneen adapts, she tries new foods and even starts a small business. Food scenes contrast the old village life with the new city realities, symbolizing both cultural loss and new opportunities. Ali shows food as a quiet battleground for identity in immigrant communities. In all seven books, food helps characters resist losing their roots through memory and daily habits. At the same time, it shows the pain and necessity of assimilation. This creates hybrid identities that are difficult but creative. Real life mirrors these stories in immigrant restaurants, food festivals, and cultural reclamation. Limits exist: access to ingredients, gender roles, race, and class affect these connections. Food is never neutral—it is tied to politics, history, and power.

Conclusion

Literature uses food powerfully to explore identity. Lahiri connects immigrants to their past, Tan mends mother-daughter relationships, Esquivel shows rebellion, Rushdie preserves national history, Morrison heals deep wounds, Smith celebrates multicultural mixing, and Ali portrays personal growth through food. Food symbolizes resistance by keeping traditions alive and

assimilation through necessary compromises. These books celebrate in-between spaces where new identities are born. Food remains a universal language for struggle, hope, and healing.

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The author is also deeply thankful for the opportunity to examine the selected literary works of Jhumpa Lahiri, Amy Tan, Laura Esquivel, Salman Rushdie, Toni Morrison, Zadie Smith, and Monica Ali, which form the central basis of this study.

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Conflicts of interest
The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Original Article

Digital Transformation And Sustainable Innovation In Entrepreneurial Ventures: Drivers, Barriers, And Performance Outcomes.

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Abstract

Digital transformation and sustainable innovation increasingly collide in the same boardroom, product roadmap, and funding pitch. Yet for startups operating on limited capital, small teams, and compressed timelines, the practical question of how to pursue both simultaneously—and whether doing so actually pays off—remains surprisingly under-theorised. This study addresses that gap. We examine the drivers' pushing founders toward integrating digital transformation with sustainable innovation, the barriers resisting that integration, and whether business model innovation serves as the mechanism that converts digital capabilities into genuinely sustainable value. We also assess downstream effects on triple-bottom-line performance. Drawing on a qualitative secondary research design, we conducted a thematic analysis of 87 academic articles, 42 industry magazine features, 14 books, and 35 blog posts and podcast transcripts, supplemented by a close reading of 50 sustainability reports and 30 founder interview transcripts. Founder cognition—framing digital tools as vehicles for sustainability rather than parallel workstreams—emerged as the strongest internal driver. Externally, however, resource scarcity and a persistent misalignment between what investors say they value and what their term sheets actually reward acted as stubborn, sometimes paralysing bottlenecks. Business model innovation proved to be the critical mediating link; without it, digital investment and sustainable intent remained loosely connected and often contradictory. Where integration did occur, triple-bottom-line performance improved meaningfully, though gains appeared first in environmental and social dimensions, with economic returns trailing behind. Theoretically, we weave together Dynamic Capabilities and Resource Orchestration perspectives into an integrative framework. Practically, the findings speak to founders navigating dual agendas, impact-oriented investors aligning milestones with slower sustainability timelines, and policymakers designing support that lowers the cost of pursuing digital agility and sustainable purpose together.

Keywords: *Digital transformation; sustainable innovation; business model innovation; triple-bottom-line; startups; dynamic capabilities; resource orchestration; thematic analysis*

Introduction

Something has shifted in the way new ventures are built, and it has happened quietly enough that much of the academic literature has not quite caught up. On one side, digital technologies—artificial intelligence, the Internet of Things, blockchain, cloud-native platforms—have moved from being competitive advantages to being basic infrastructure. A startup that does not think digitally is, increasingly, a startup that does not think at all. On the other side, sustainability has stopped being a section in an annual report and has become a survival condition. Investors ask about carbon footprints in seed rounds. Consumers check supply-chain ethics before clicking "buy." Regulators in the EU, India, and parts of Southeast Asia are tightening disclosure norms faster than many young firms can adapt. These two pressures do not arrive separately. They arrive together, in the same pitch meeting, the same product-design sprint, the same conversation with a first institutional investor. And for a venture with forty employees and eighteen months of runway, that simultaneity is not a strategic luxury. It is an operational problem. Here is where the literature thins out considerably.

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Digital entrepreneurship and sustainable entrepreneurship have grown into robust, well-cited subfields, but they have largely grown apart from each other. We have rich accounts of how digital tools help startups scale, reach underserved markets, and reduce transaction costs. We have equally rich accounts of how sustainable practices build long-term resilience, attract patient capital, and satisfy stakeholder expectations. What we do not have—what is conspicuously missing—is a clear understanding of the mechanisms through which an early-stage, resource-constrained venture actually weaves these two agendas into a coherent strategy. How does a founder with limited capital decide whether to invest the next tranche of funding in an AI-driven logistics platform or in a circular-materials redesign? What barriers make that decision harder than it needs to be? And when the integration does happen, does it genuinely improve performance across economic, environmental, and social dimensions, or do the gains concentrate in one area while the others quietly suffer? Large multinational corporations can absorb these tensions through dedicated sustainability divisions, internal R&D budgets, and lobbying capacity. Startups cannot. They face institutional voids, investor expectations calibrated for hypergrowth, and the daily pressure of cash-flow management. The strategies available to a Fortune 500 firm are simply not the strategies available to a three-year-old venture in Nairobi, Bangalore, or Manchester. And yet most of our theoretical frameworks—Dynamic Capabilities, the Resource-Based View, even the more recent work on digital ecosystems—were built with larger, more stable organisations in mind. Applying them uncritically to startups risks producing elegant models that describe very little of the lived reality. This article grew out of that frustration. Rather than asking whether digital transformation and sustainable innovation are related—a question the literature has largely settled—we wanted to understand how the integration actually works in practice, what blocks it, and through what mechanism it translates into multidimensional performance. The ambition is not just theoretical. If we can identify where the bottlenecks are and how they might be eased, the findings should matter to founders trying to make these decisions on Tuesday afternoon, to impact investors designing milestone structures that do not punish patience, and to policymakers considering whether blended-finance instruments or regulatory sandboxes could lower the cost of doing both things at once.

2. Literature Review and Theoretical Framework

1 The State of the Field

The literature informing this study does not sit neatly within a single disciplinary boundary. It draws from strategic management, entrepreneurship, sustainability science, information systems, and organisational theory. Digital transformation research has matured considerably since Bharadwaj et al. (2013) repositioned it from IT adoption to structural reconfiguration, and Vial (2019) provided a systematic review that moved the conversation from "did you adopt the technology?" to "did the technology change who you are and how you compete?" For entrepreneurial ventures, this distinction is especially sharp: a startup does not digitise a legacy process the way a multinational does. In many cases, the digital architecture is the venture (Nambisan et al., 2017). Sustainable innovation, as a construct, carries a complicated genealogy. From the eco-innovation literature of the 1990s through Elkington's (1997) triple bottom line to Schiederig et al.'s (2012) definition requiring simultaneous economic viability, environmental stewardship, and social value, the concept has broadened considerably. But this broadening introduced a persistent tension: when economic, environmental, and social goals pull in different directions, which logic governs? For startups, the answer is often pragmatic and sequential—economic survival first, environmental commitments second, social impact third—because the resources to pursue all three concurrently simply do not exist at the seed stage (Klewitz & Hansen, 2014). The intersection of these two streams remains surprisingly sparse. Bai et al. (2020) examined how Industry 4.0 technologies enable circular economy practices in manufacturing firms. Ghobakhloo (2020) proposed a conceptual framework linking digitalisation to sustainability through organisational learning. But these studies focused on mid-sized or established firms, not entrepreneurial ventures. What strikes us as missing is attention to the friction of convergence—the implicit assumption that digital transformation and sustainable innovation are naturally complementary, when in practice the carbon footprint of AI training, the energy demands of data centres, and the e-waste from rapid hardware cycles can undermine the very sustainability goals digital tools are meant to advance. The drivers of integration, where they are discussed, tend to cluster around founder cognition (Shepherd, Patzelt, & Haynie, 2010), institutional pressures (DiMaggio & Powell, 1983; York et al., 2016), and market signals (White, Habib, & Hardisty, 2019). The barriers are more material: resource scarcity (Mair & Martí, 2006), investor misalignment (Horisch, 2015), and the "valley of death" between seed and Series A where sustainability metrics rarely feature in evaluation criteria. Business model innovation has been identified as a likely mediator (Boons & Ludeke-Freund, 2013; Foss & Saebi, 2017), but the mediating pathway has not been empirically validated in the entrepreneurial context.

Research Objectives and Hypotheses

Having mapped the gaps in the literature, we shaped our inquiry around four objectives that build sequentially. The first is exploratory: to identify the critical drivers and barriers influencing DT–SI integration. The second examines the mediating role of Business Model Innovation in translating digital capabilities into sustainable value. The third evaluates whether digitally enabled sustainable innovation improves performance across all three TBL dimensions or whether gains are uneven. The fourth is synthetic: to develop an integrative theoretical framework weaving these dynamics together.

From these objectives, we derived three hypotheses:

H_1: Internal drivers (founder vision, digital maturity) positively influence DT–SI integration, while external

barriers (resource scarcity, institutional voids) negatively influence it—a push-pull dynamic.

H_2: BMI positively mediates the relationship between digital capabilities and sustainable innovation outcomes.

H_3: Digitally enabled sustainable innovation has a significant positive impact on TBL performance, though environmental and social returns materialise more quickly than economic returns.

The three hypotheses form a chain: H_1 establishes antecedent conditions, H_2 identifies the mechanism, H_3 evaluates the consequence. Together, they trace the journey from intention to mechanism to outcome, mirroring the practical arc a founder walks when building at the intersection of digital and sustainable imperatives.

Methodology

1 Design Rationale

This study is grounded entirely in secondary research, and we want to be transparent about that choice and its implications. The phenomenon under investigation has generated an enormous volume of written commentary over the past decade. Academic journals have produced theoretical frameworks. Industry magazines have documented case studies. Founders have narrated their struggles in long-form interviews and blog posts. Books have synthesised these threads into broader narratives. Taken together, this body of material constitutes a rich, multi-voiced archive of how the DT–SI nexus is being understood, practised, contested, and reimagined across different contexts. Our conviction was that this archive, if approached systematically and critically, could yield insights that a single primary survey—limited by sample size, recall bias, and the artificiality of structured questionnaires—could not. We did not want to ask founders what they thought they did. We wanted to examine what they wrote, what they published, and what observers recorded about them. The temporal proximity of these sources to the events they describe reduces the distortion of hindsight.

2 Data Corpus

The corpus comprised four categories of sources: (a) 87 peer-reviewed academic articles drawn from journals including the Strategic Management Journal, Journal of Cleaner Production, MIS Quarterly, and Journal of Business Venturing; (b) 42 industry magazine features from publications such as Fast Company, MIT Technology Review, and Forbes; (c) 14 books spanning entrepreneurship, sustainability, and digital strategy; and (d) 35 blog posts and podcast transcripts from founder-led platforms. Additionally, we conducted close readings of 50 sustainability reports and 30 founder interview transcripts to ground the thematic analysis in operational detail.

3 Analytical Approach

We analysed the material using thematic content analysis following Braun and Clarke's (2006) six-phase framework. The process was iterative, not linear. We moved between phases, revisiting earlier codes as later sources complicated our interpretations. Coding was conducted manually for books and magazines, and using NVivo 14 for the larger corpus. We generated over 340 initial codes, subsequently clustered into coherent themes. A defining feature was cross-source triangulation: we read the four source categories against one another, treating convergence as confidence-building and divergence as analytically interesting. We also conducted negative case analysis, actively searching for sources that contradicted each emerging theme. Trustworthiness was established through reflexive journaling, peer debriefing with two external colleagues, and maintenance of a detailed audit trail (Lincoln & Guba, 1985). All sources are publicly available; no proprietary material was accessed.

5. Findings and Analysis

1 Drivers: The Founder's Mind and the Digital Backbone

The most frequently cited internal driver across both reports and interviews was founder vision. But its specific character in the DT–SI context surprised us. In sustainability reports, vision was presented aspirational—polished, forward-looking, stakeholder-friendly. In interviews, it was biographical—rooted in formative experiences, personal convictions, and identity commitments. A founder on The Impact Entrepreneur podcast captured it plainly: "I never thought of the software and the sustainability as two things. The algorithm was the sustainability. Separating them would have been like separating the engine from the car." This framing—digital capability as inseparable from sustainable purpose—appeared in over 60 percent of founder narratives. It was markedly less prevalent in the academic literature, which tended to treat the two as distinct constructs to be "linked." The gap between lived experience and scholarly categorisation was, we confess, one of the most striking patterns in the data. Digital maturity emerged as a structural enabling condition. Ventures with sophisticated data infrastructure were significantly more likely to embed sustainability into core operations rather than treating it as an add-on. The implication was clear: digital maturity does not cause sustainable innovation, but it creates the infrastructure through which sustainability becomes operationally feasible. Without the data architecture to measure, track, and optimise resource flows, sustainability commitments remain rhetorical rather than operational.

2 Barriers: Where the Integration Stalls

If the drivers were cognitive and internal, the barriers were overwhelmingly material and structural. Resource scarcity was, by a wide margin, the most frequently cited constraint. A founder on the SaaS Scaling podcast described the trade-off with painful directness: "Every dollar I put into the sustainability audit is a dollar I'm not putting into engineering. And if the product breaks, no one cares about my carbon footprint." The lack of patient capital was the most severe barrier. Traditional venture capital operates on fund lifecycles expecting returns within five to seven years. Deep-tech sustainable innovations often require longer gestation periods. The temporal mismatch was described not as a minor friction but as a structural bottleneck threatening the viability of the entire DT–SI proposition. A founder profiled in Fast Company noted: "They loved the mission. Then they asked for my eighteen-month revenue

projection, and the conversation changed." Investor misalignment compounded this. Several founders described a frustrating dynamic in which investors praised sustainability rhetoric during pitch meetings but tied term-sheet milestones exclusively to growth and revenue metrics, leaving little room for the slower returns that sustainable innovation requires. The gap between stated values and financial incentives was not subtle. It was structural, and it shaped behaviour decisively.

3 Business Model Innovation: The Bridge That Holds or Breaks

The academic literature was broadly consistent: digital capabilities do not automatically generate sustainability outcomes. They require a mediating reconfiguration of the business model. A 2023 MIT Sloan Management Review article profiled a European agtech startup whose AI-driven soil monitoring system generated no sustainability impact until the business model shifted from selling hardware to offering "soil health as a service." The value proposition changed from product to outcome. That shift was the act that converted a digital tool into a sustainable value proposition. But the practitioner sources complicated the academic narrative in ways we found both humbling and important. In interviews, BMI was described not as a strategic choice but as a survival mechanism. A founder whose sustainable packaging startup had pivoted twice in three years said: "The first model was beautiful on paper. And nobody bought it. So, we had to tear it down and start again. Not because we wanted to innovate the business model. Because we had to, or we were going to die." This framing—BMI as survival rather than strategy—suggests the mediating role is not always proactive and capability-driven. Sometimes it is reactive, desperate, and improvisational.

Where BMI was absent, integration failed. Several sources described startups with strong digital capabilities and genuine sustainability commitments that could not translate them into value because their business model remained unchanged. The digital capability existed. The sustainability knowledge existed. The business model innovation did not. And the integration collapsed. The pattern was consistent enough to be treated as a structural finding rather than an anecdotal observation.

4 Triple Bottom Line Performance: Uneven and Delayed

The most consistent pattern across sources was a temporal asymmetry in TBL returns. Environmental performance metrics responded relatively quickly to digitally enabled sustainable innovation, often within 12 to 18 months. Social indicators showed a similar, though slightly slower, trajectory. Economic performance lagged. Revenue growth and profitability for startups pursuing integrated DT–SI strategies were, in the majority of cases, below benchmarks set by purely digital ventures in their first three years. This asymmetry brought us back to the investor misalignment theme with renewed urgency. If economic returns lag while environmental and social returns materialise earlier, the venture capital model—which evaluates on short horizons—will systematically undervalue sustainability-oriented startups. A founder writing on Substack captured the emotional weight of this reality: "The hardest part is sitting in a room with people who believe in what you're doing and watching them do the math in their heads and decide the math doesn't work yet. And knowing they're not wrong. And knowing the math will work, but not on their timeline." The social dimension was the least measured and most contested. Academic articles used inconsistent proxy measures. Magazine features narrated impact through individual stories. We concluded tentatively that socially oriented outcomes are real but poorly captured by existing measurement frameworks—a finding that carries implications for both research design and policy evaluation.

Discussion

The findings paint a picture that is neither wholly optimistic nor wholly pessimistic, but deeply conditional. The DT–SI nexus is not a natural convergence that happens automatically when a startup adopts digital tools and declares a sustainability mission. It is a constructed integration, requiring specific cognitive orientations in the founder, specific material resources, a specific mediating mechanism in the form of business model innovation, and a specific temporal patience that the current investment ecosystem often does not provide. The dominance of founder cognition as a driver confirms and extends the upper echelons literature (Hambrick & Mason, 1984) into the entrepreneurial context. But it also raises a troubling implication: if integration depends so heavily on individual conviction, then the absence of that conviction—which is the norm, not the exception—means most startups will not pursue integration unless structural incentives change. Vision is necessary but not sufficient, and a system that relies on visionary outliers to achieve sustainability goals is a fragile system. The patient capital deficit is not merely a financial problem. It is an epistemological one. Investors and founders are operating with different definitions of value and different time horizons. Until the capital structure is redesigned—through longer fund lifecycles, revenue-based financing, blended public-private instruments, or milestone structures that reward sustainability progress alongside revenue growth—the bottleneck will persist regardless of how strong founder conviction is. Mazzucato's (2013) work on the entrepreneurial state resonates here: the public sector has a role in absorbing early-stage risk that private capital, structured as it currently is, will not absorb voluntarily. The finding that BMI mediates the relationship between digital capabilities and sustainable outcomes has both theoretical and practical significance. Theoretically, it confirms Boons and Luedke-Freund's (2013) argument that sustainable innovation is inseparable from business model redesign. Practically, it tells founders that investing in digital infrastructure without simultaneously rethinking the business model is likely to produce disconnected capabilities rather than integrated value. The technology is necessary. The model redesign is what makes it count. The temporal asymmetry in TBL performance is perhaps the most policy-relevant finding. If environmental and social returns precede economic returns, then the standard venture evaluation framework—which privileges near-term financial

metrics—will systematically undervalue ventures that are generating genuine sustainability impact. This is not a market failure to be lamented. It is a design problem to be solved, through patient capital structures, impact-weighted accounting, and regulatory frameworks that make sustainability performance visible and financially legible to investors.

Conclusion and Implications

This study set out to understand how entrepreneurial ventures integrate digital transformation with sustainable innovation, what blocks that integration, and whether the effort produces measurable performance gains. The answers are conditional, nuanced, and occasionally uncomfortable. Integration is driven primarily by founder cognition and enabled by digital maturity. It is obstructed primarily by resource scarcity and investor misalignment. It is mediated by business model innovation, which functions less as a planned strategic choice and more as an iterative, sometimes desperate, survival mechanism. And it produces triple-bottom-line gains that are real but uneven, with environmental and social returns arriving before economic ones. For founders, the evidence underscores that business model innovation is not a secondary exercise but the central lever through which digital and sustainable ambitions become mutually reinforcing. The technology gets you to the starting line. The business model redesign is what actually moves you forward. For investors who describe themselves as patient or impact-oriented, the data suggest that aligning milestone structures with the actual tempo of sustainable value creation is not charity—it is how you protect long-term portfolio viability. The eighteen-month revenue projection is the wrong instrument for measuring a venture whose environmental and social returns will arrive before its financial ones. For policymakers, the external barriers identified here point toward interventions—blended finance instruments, regulatory sandboxes, standardised sustainability disclosure frameworks—that could meaningfully lower the cost of pursuing both agendas simultaneously. The goal is not to subsidise inefficiency but to correct a temporal mismatch that the market, left to its own devices, will not correct. We offer these findings not as a final word but as a structured reading of an archive that is still being written. The startups we studied are still operating, still pivoting, still negotiating the tension between growth and purpose. The regulatory landscape is still shifting. The technology is still evolving. What we have offered is a snapshot, taken at a particular moment, through a particular analytical lens. We hope it is useful. But we would be disappointed if it were the last one.

Limitations and Future Research

No study escapes the boundaries of its own design, and intellectual honesty requires us to name ours. The secondary nature of our data means we could not control for every contextual variable. Ventures that report sustainability metrics are likely more visible and formalised than those that do not, introducing mild survivorship and self-selection bias. The cross-sectional window limits causal claims; we can speak about associations and mediating pathways, but temporal sequencing remains inferential. Our qualitative sources skew toward ventures that survived long enough to publish a report or agree to an interview. The startups that failed silently are underrepresented, and their stories would likely complicate the more optimistic findings. The sectoral focus on tech-enabled ventures means the framework may travel less smoothly into asset-heavy industries. And the geographic spread, while spanning multiple regions, does not permit rigorous institutional comparison. Future research should pursue longitudinal designs tracking ventures over three to five years, incorporate primary data collection to capture the voices of failed ventures, extend the framework into manufacturing and agricultural contexts, and conduct dedicated cross-institutional comparisons. The framework proposed here is a starting point. It will need testing, stretching, and perhaps breaking by scholars working in different sectors, longer time horizons, and more varied institutional settings before it can claim the robustness the topic deserves.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Agricultural Innovation Plant Resources in Fish Ffed Formulations

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Abstract

Fish feed plays an important role in the growth of the aquaculture industry. Use of plant protein source in the feed industry has been in practice for various advantages such as sustainability, availability, cost effectiveness etc. Terrestrial plant leaves of mulberry, ficus, and mangroves. Currently, limited number of ingredients is used in the formulation of feeds used in intensive aquaculture. The choice of these ingredients should be based on the nutritional value taking into account potential anti-nutritional factors rather than merely on the basis of cost per unit weight alone. Taking into account these considerations, present formulation is undertaken by using plant origin sources of protein such as soyabean, maize, radish, beet root and mulberry leaves. They are used as base in feed formulation. Other ingredients used are of high nutritive and low economic value.

Keywords: Feed formulation, soyabean, maize, radish, beet root, mulberry

Introduction

Fish, like other animals, have requirements for the essential nutrients such as proteins, carbohydrates, fatty acids, vitamins and minerals in their diets, in order to grow properly. (Lovell, 1989). Plant protein supplements like deoiled ground nut oil cake, soyabean oil cake, mustard oil cake, cotton seed oil cake, etc are widely used in feeds for aquaculture practices. Properly processed plant products and by-products generally have high protein digestibility. Present fish feed is formulated to replace more expensive fishmeal and prepared from locally available raw materials. For a long period of time in history, plants have been valuable and indispensable sources of natural products for the health of human beings and they have a great potential for producing new drugs (Bandaranayake, 2002,). Even today people who live near to the forests use plant products to cure chronic diseases. Tropical and subtropical areas of the world are bestowed with abundant flora and herbs which have untapped properties, such as antimicrobial, antiviral and antifungal. According to the World Health Organization, plants are a source of compounds that have the ability to combat disease, antimicrobial, antiviral and antifungal activities (Kokpal,1998). In addition, medicinal plants have been used for centuries as remedies for human ailments and diseases because they contain components of therapeutic value (FAO, 1982). Also they are less toxic to humans and environmentally friendly due to less pollutants produced in production and have minimal health hazards (Bandaranayake,1998). A large amount of revenue of the world has to pay for the health care.

Materials and Methods

Soyabean meal : Soyabean meal is most frequently studied dietary ingredient as a fish meal replaced in diets for many fish species for its high protein content, relatively well balanced amino acid profiles, reasonable price and steady supply (Storebakenet al.2000). Protein and oil content accounts for about 60% of dry soybeans by weight. The other contains include 35% carbohydrate and 5% ash (USDA). Nutritional value of soyabean/100 gms Carbohydrate: 30.16gm; Sugars: 7.33gm; Dietary Fiber: 9.3gm; Fat: 19.94gm; Protein: 36.49gm; Energy: 450Kcal (USDA-2004).

Maize: Maize is also used as animal feed and raw material for industrial use. Maize constitutes an important source of carbohydrates, protein, vitamin B, and minerals.

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As an energy source, it compares favourably with root and tuber crops, and is similar in energy value of dried legumes. Furthermore, it is an excellent source of carbohydrate and is complete in nutrients compared to other cereals. Nutritional value of maize/100 gms Carbohydrates: 11.90gm; Proteins: 2.45 gm; Fats: 14gm; Dietary fibers: 3.0gm; Energy: 47 Kcal. 2.2.3. **Radish** is rich in ascorbic acid, folic acid, and potassium. They are a good source of vitamin B6, riboflavin, magnesium, copper, and calcium. Nutritional value of radish/100 gms Carbohydrates: 9.96gm; Proteins: 1.68 gm; Fats: 18gm; Dietary fibers: 2.0gm; Energy: 43 Kcal; and Vitamins like A, B complex and C. It has practically no fat and cholesterol (USAID). **Beetroot:** Beetroot is a rich source of carbohydrates, proteins, and has high levels of important vitamins, minerals and micronutrients. Nutritional value of beetroot/100 gms Beetroot contains 66g sodium (Na) and 380g potassium (K)(USAID). **Mangrove leaves**: Mangrove leaves contain biological active antiviral, antibacterial and antifungal compounds. It contains secondary metabolites like alkloids, phenolics,steroids and terpenoids. Milk powder: It is add in feed formulation for its nutritional properties. It contains 20 standard amino acids. It is rich in soluble vitamins and minerals. According to USAID the typical average nutrient in the unreconstitued milk are 36% proteins, 52% carbohydrates, particularly lactose and calcium 1.3%. It is fortified with vitamin A and D (USAID -Jan.2004). Along with plant resources other ingredients such as milk powder, corn flour, eggs, cod liver oil, vitamin mixture containing vitamin B Complex and E, agar powder, garlic paste, pepper powder and cumin powder were used. 2.1 Preparation of feed Soyabean meal (80gm) was taken in powder form as principal ingredients. Other ingredients like milk powder (60 gm), corn flour (20 gm), and eggs (70 gm) were added and mixed well Agar powder (4 gm) was added as binding agent; turmeric (0.5gm) and garlic (1 gm) as antibiotics. Milk powder In present feed formulation **Nestle milk powder** was used. It contains 20 standard amino acids. It is rich in soluble vitamins A, D and minerals. Typical average nutrient in the unreconstituted milk are 36% proteins; 52% carbohydrates (particularly lactose); and 1.3% calcium. Nutritional value of milk powder / 100 gms Protein: 20.5 gm; Carbohydrates: 52.7gm; Fats: 19gm; Saturated Fatty Acids: 10.9 gms; Cholesterol: 0.05 gm; Mono Unsaturated Fatty Acid: 4.21gm; and Poly Unsaturated Fatty Acid (PUFA): 0.41gm9 2.2.6 **Egg** Egg albumin contains 15% of proteins dissolved in water. It contains about 40 different types of proteins. The proteins in egg white are, ovalbumin: 64%; ovatranseferin: 12%; ovomucoid: 11%; ovamucin: 1.5%; globulin: 8%; and lysosymes: 3.5% 8 (USDA, 2008). 2.2.7

Corn flour Corn flour was used as filler and binder in present formulation. It contains proteins: 3 gms; carbohydrates: 23gms; and fat: 1gm. The major ingredients are maize and starch. Starch acts as additive in feed processing. It has 110 calories per gm8 .(USDA, 2008). 2.2.8

Cod liver oil Cod liver oil is derived from the liver of cod fish Gaduscallarias. It has a mild fishy taste and smell. It contains small amount of fish protein [10]. (Aviram M, Brox J. Nordoy A, 1986). It is a good source of the vitamin A and D, as both the vitamins are nutritionally important to body. Cod liver oil along with vitamin E prevents the body from increasing oxidant stress. It helps to reduce generation of free radicals in body. It has been used in form of a gelatin coated capsule named as Seacod. Each single soft gelatin capsule contain 300 mg of cod liver oil. 2.2.9

Agar powder Agar powder used as binding agent. It helps to form a unique mass of the feed. It is a polymer made up of subunits of sugar galactose. It acts as an emulsifying and suspending agent in many feed products. 2.2.10

Vitamin mixture Vitamin B and E were used as vitamin mixture in equal proportions. Vitamin B complex Each capsule of vitamin B complex is composed of Thiamine mononitrite; Vitamin B2, B6, B12; Nicotinamide; Folic acid; Biotin; and Titanium dioxide. It promotes activity of enzymes. It plays an important role in cell growth and metabolism. (Vera Reader, 1930).Vitamin B is an essential nutrient for growth, development and other bodily functions [12]. (Guyton JR., Boys HF., 2007). Vitamin E Each soft gelatin capsule contains Tocopherol acetate of 400 mg. It acts as an antioxidant, protects body against free ~ 80 ~ International Journal of Fisheries and Aquatic Studies radicals, which are potentially damaging by products of energy metabolism. DL-X Tocopherol acetate is the form used while formulating feed. 2.2.11

Turmeric powder (Curcuma longa) It was added for its antibacterial, anti-inflammatory and hepatoprotective properties. It functions as an antioxidant and adjutants in feed preparation. Turmeric used to protect the feed from sunlight [13]. (Shrinivasan M. and Satya Narayan, 1987). It adds warm, mild aroma and distinctive yellow color to the feed. It is also hypolipidemic [14]. (Khanna K. M., Sarine J. P and Singh S, 1904). Nutritional value of turmeric /100 gms. Protein: 8.6%; Carbohydrates: 63.0%; Fat: 8.9%; Fiber: 6.9%; Total ash: 6.9%; Moisture: 5.8%; Calcium: 6.2%; and, Iron: 0.05%.The caloric value is 390 calories per 100 gm (USAID, 2004). It also contains 5% essential oil, and 3%

Carcumin which is a polyphenol [15]. (Sharma S; Agarwal S; and Kulkarni SK, 2006). 2.2.12 Garlic paste: (Allium sativum) It is used for its antibiotic and antibacterial properties [16]. (American Chemical society, 2002). Nutritional value of garlic / 100 gms Moisture: 62.8%; Protein: 6.3%; Carbohydrates: 29%; Fiber: 0.8; Total fat: 0.1%; Total ash: 1.0%; Calcium: 0.03%; Phosphorus: 0.31%; Iron: 0.001%; Vitamin C: 13 mg; and Nicotinic acid: 0.4 mg. The caloric value is 1429 (USAID, 2004). 2.2.13

Pepper powder: (Pepper nigrum) It is used as a stimulant for appetite. In India it is used in number of health related problems [17]. (H. J. D. Dorman and S. G. Deans 2000). Pepper has two main components- volatile oil and pungent component commonly known as pipperine. Black pipers contain 0.6 to 2.6% essential oil. Nutritionally pepper contains Vitamins A, B and C. 2.2.14

Cumin powder (Cuminumcyminum) Research in animals indicates that it stimulate the secretion of pancreatic enzymes, important factors in nutrient digestion and assimilation. Nutritional value of cumin / 100 gms. Carbohydrates 44.24 gm; proteins 17.81 gm; fats 1.53; dietary fibers 10.5 gm; iron 66.36mg; sodium 168 mg; zinc

4.8 mg; calcium 931 mg; vitamins such as A 64 mg; thiamine B1 0.628 mg; riboflavin B2 0.327 mg; niacin B3 4.579 mg; foliate B9 10 mg; vitamin C 7.7 mg; and E 3.38 mg9 (USDA,2008). The said mixture was boiled, cooled at room temperature, after cooling cod liver oil (3.5 ml), vitamin mixture of vitamin B complex (1gm) and vitamin E (1 gm) were added. It was kept under refrigeration for 12 hrs. After 12 hrs it was squeezed over polythene sheet and dried at room temperature for 48 hrs. The dried nodules are crushed into small pellets then pellets are sun dried to avoid fungal infection, weighted and stored in the bottle.

Results and Discussions

Aquaculture feed ingredients are mostly by-products of processing or milling industries. In formulation of feeds, these ingredients are included and substitutions made within mixtures in accordance with market price, local availability and composition. Basically, the concept is to use available ingredients in most economical way to provide essential nutrient content and balance of the final diet.Different proportions of less expensive ingredients can often be combined to achieve the nutrient balance of more expensive ones. However, it is necessary to consider factors such as the quality, palatability and functional properties of ingredients and possible content of anti-nutritional components that are known to affect the growth and health of fish. Among ingredients of plant origin, relatively high crude protein contents and well-balanced amino acid profile of ingredients in fish feeds. The steady supply of plant protein resources and composition of various products with respect to nutrient composition and physical characteristics in feed processing are positive factors that contribute to their widespread use in feed formulation. There is great scope to enhance production of fish by supplementary feed (Pantha 1993).

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Original Article

Representing India in the Novels of Chetan Bhagat

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Abstract

Chetan Bhagat is one of the most widely read and commercially successful contemporary authors in India. His novels capture the pulse of modern urban India, exploring the complex social realities, generational conflicts, and cultural shifts brought about by economic liberalization and globalization. This research paper examines how Bhagat constructs and represents contemporary India across his seminal works, including Five Point Someone, 2States, and 3 Idiots (adapted from Five Point Someone). Moving beyond traditional elitist postcolonial frameworks, Bhagat adopts accessible, conversational English and relatable narratives that resonate with the Indian middle class and youth. This study investigates the thematic intersections of rigid academic pressure, patriarchal family structures, cross-cultural marriages, and socio-economic inequality. By analyzing his character tropes, setting choices, and colloquial dialogue style, this paper argues that Bhagat's fiction serves as a significant sociological mirror of twenty-first-century India, capturing the ongoing friction between traditional societal expectations and individual modern aspirations.

Keywords: *Chetan Bhagat, Contemporary Indian English Literature, Globalization, Middle-Class Youth, Cultural Identity, Social Realism.*

Introduction

The landscape of Indian English literature has undergone a massive transformation over the past three decades. Historically, Indian English writing was largely dominated by high-brow literary fiction characterized by ornate language, postcolonial nostalgia, and diaspora themes meant primarily for an international readership. Writers like Salman Rushdie, Vikram Seth, and Arundhati Roy crafted intricate masterpieces that won global acclaim but often felt distant from the everyday realities of ordinary middle-class Indians. However, the turn of the twenty-first century marked a dramatic shift. With the advent of economic liberalization in 1991, India experienced rapid urbanization, a booming IT sector, consumerism, and an unprecedented explosion of middle-class aspirations. Out of this socio-cultural crucible emerged a new brand of popular fiction that spoke directly to the common man. At the forefront of this literary revolution stands Chetan Bhagat.Chetan Bhagat published his debut novel, Five Point Someone: What not to do at IIT!, in 2004. Since then, he has authored a series of bestsellers that have redefined the reading habits of millions of Indians. Despite facing criticism from traditional literary critics who often dismiss his work as formulaic or lacking linguistic sophistication, Bhagat's cultural impact is undeniable. He democratized reading in India, making books accessible to tier-2 and tier-3 cities where English is spoken as a second or third language. More importantly, Bhagat's novels serve as an authentic sociological mirror of contemporary India. They capture the anxieties, dreams, failures, and triumphs of a generation caught between ancient traditions and modern global ambitions. This research paper explores how Chetan Bhagat represents India, analyzing his thematic preoccupations with education, family dynamics, regional identities, and class mobility.

The Socio-Economic Backdrop: Globalization and Middle-Class Aspirations

To understand the India depicted in Bhagat's novels, one must examine the socio-economic backdrop of post-liberalization India.

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The 1990s economic reforms dismantled the License Raj, opened Indian markets to multinational corporations, and created a massive demand for engineers, managers, and IT professionals. In this high-stakes environment, education ceased to be merely a pursuit of knowledge; it became the ultimate ticket to upward social mobility. Every middle-class Indian family invested their hopes and finances into prestigious entrance exams and elite institutions like the Indian Institutes of Technology (IITs) and Indian Institutes of Management (IIMs).Bhagat's early novels—such as Five Point Someone and One Night @ the Call Center—plunge directly into this competitive pressure cooker. In Five Point Someone, the protagonist Ryan, Hari, and Alok represent the archetypal engineering students who find themselves trapped within an archaic, mechanical educational system that prioritizes rote memorization and GPA over actual learning and creativity. The rigorous grading system of the IIT becomes a metaphor for Indian society's ruthless obsession with standardized success. Bhagat highlights how young minds are crushed under parental expectations and societal judgment. The representation of India here is one of institutional rigidity, where career choices are dictated not by personal passion, but by societal status.Furthermore, in One Night @ the Call Center, Bhagat shifts his lens to the burgeoning call center industry, which employed thousands of urban youth working night shifts to service Western clients. This setting illustrates the paradoxical nature of globalized India: while young Indians earn handsome salaries and experience corporate autonomy, they simultaneously suffer from deep alienation, identity crises, and cultural displacement. They adopt Western names, adjust their sleep cycles to US time zones, and deal with demanding overseas customers, symbolizing a nation navigating the uneasy synthesis of traditional Indian roots and Western corporate capitalism.

Family Dynamics, Parental Authority, and Generational Conflict

A central pillar of Indian culture is the family unit. In Bhagat's fiction, the family is portrayed as both a profound source of emotional support and an oppressive institution of social control. Generational conflict is a recurring motif across his works, particularly as the younger generation attempts to assert individual autonomy in matters of career, lifestyle, and marriage against traditional parental mandates.In 3 Idiots (and its source novel Five Point Someone), this conflict is starkly dramatized through characters like Raju's impoverished family struggling with medical debt, and Farhan's father forcing his son into engineering despite his passion for wildlife photography. Indian parents in Bhagat's novels are not malicious caricatures; rather, they are products of their own socio-economic struggles. Having lived through periods of economic scarcity, their obsession with secure, prestigious professions (like engineering or medicine) is rooted in a desire to secure financial safety for their children. However, this protective instinct often manifests as emotional blackmail and authoritarian control.This theme reaches its comedic and poignant zenith in 2 States: The Story of My Marriage. Here, Bhagat explores regionalism, caste, and community prejudices within the Indian family structure. The novel chronicles the romance between Krish Malhotra, a Punjabi boy from Delhi, and Ananya Swaminathan, a Tamil Brahmin girl from Chennai. The narrative exposes the deep-seated cultural biases that persist beneath the veneer of modern Indian cosmopolitanism. Despite being educated, successful professionals in the corporate sector, Krish and Ananya face fierce resistance from their parents simply because of inter-community marriage taboos. The representation of India in 2 States is one of cultural pluralism colliding with narrow regional parochialism. Bhagat uses humor and satire to bridge these divides, ultimately demonstrating that national integration in India must begin at the micro-level of family acceptance.

Gender Roles, Patriarchy, and the Modern Indian Woman

Representation of gender in Chetan Bhagat's novels has evolved over time, reflecting the changing status of women in contemporary India. In his earlier novels, female characters often served secondary roles—either as romantic interests who provided emotional grounding to the male protagonists or as conventional career women navigating male-dominated corporate environments. However, works like 2 States, Revolution 2020, and Half Girlfriend present increasingly nuanced portrayals of female agency, ambition, and resilience.In 2 States, Ananya Swaminathan is depicted as an independent, intelligent, and strong-willed woman who excels in her career and takes charge of bridging the cultural gap between the two families. Unlike traditional female tropes in popular media who wait for male saviors, Ananya is an equal partner in every respect. Similarly, in Revolution 2020, Aarti represents the dual pressures faced by modern women—caught between personal ambition, societal expectations of marriage, and economic independence in a rapidly commercialized small-town India (Varanasi).However, feminist critiques of Bhagat's fiction often point out that his narratives remain fundamentally male-centric, with male protagonists driving the core plots. While female characters are granted professional competence, they are frequently evaluated through the lens of romantic desirability and traditional family values. Nevertheless, Bhagat's depiction of women accurately mirrors the transitional phase of Indian society—where women are entering the workforce in record numbers and asserting their choices, yet still navigating deeply entrenched patriarchal expectations regarding marriage, chastity, and family honor.

Linguistic Realism: The Power of Hinglish and Accessible Prose

One of the most significant literary contributions of Chetan Bhagat is his deliberate choice of language. For decades, Indian English literature was critiqued for using an elitist, hyper-formal vocabulary that alienated the domestic working and middle classes. Bhagat shattered this convention by adopting an accessible, conversational style of writing infused with Indian colloquialisms, Hindi

phrasing, and 'Hinglish'.Bhagat's prose mimics the natural speech patterns of urban Indian youth. Terms like *yaar*, *panga*, *jugaad*, *funda*, and direct translations of Hindi idioms appear naturally throughout his narratives. This linguistic strategy is not merely a stylistic choice; it is a profound act of cultural representation. By using simple English, Bhagat bridges the linguistic divide between elite English speakers and vernacular Hindi speakers. He validates the linguistic reality of millions of educated Indians who think in a hybrid idiom rather than pure British or American English.Academic critics have debated this stylistic shift. Traditionalists argue that Bhagat's writing lacks literary depth, grammatical rigor, and poetic resonance. However, cultural studies scholars view his prose as a triumph of democratic storytelling. In a nation where language is deeply intertwined with class privilege, Bhagat's accessible English redefines who gets to be a writer and who gets to be a reader. It reflects a confident, unpretentious new India that refuses to be intimidated by Western literary standards.

Conclusion

Chetan Bhagat occupies a unique and influential position in contemporary Indian literature and cultural studies. While his novels may not possess the technical complexity of modernist classics, their cultural significance cannot be overstated. Through accessible storytelling, relatable characters, and engaging plots, Bhagat has successfully mapped the psychological and social terrain of twenty-first-century India.This paper has demonstrated that Bhagat's novels—from Five Point Someone and 3 Idiots to 2 States and One Night @ the Call Center—offer a comprehensive critique of modern Indian life. They expose the dark underbelly of the country's educational rat race, explore the complexities of cross-cultural and inter-caste relationships within traditional families, and capture the thrilling yet exhausting promises of economic globalization. By writing in a conversational idiom that resonates with the common man, Bhagat bridges the gap between high culture and mass entertainment.Ultimately, Chetan Bhagat's fiction does more than entertain; it documents the aspirations and anxieties of a rising nation. As India continues its rapid socio-economic transformation, Bhagat's novels will remain invaluable primary texts for understanding the cultural contradictions, generational shifts, and democratic energy of modern Indian society.

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Original Article

Integrated Strategies for the Conservation of Endangered Medicinal Flora.

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Abstract

Medicinal plants constitute one of the most valuable biological resources for human health, traditional medicine, pharmaceutical industries, and ecosystem sustainability. Approximately 50,000-80,000 flowering plant species are used medicinally worldwide, with thousands threatened by habitat degradation, overharvesting, climate change, invasive species, and unsustainable commercialization. Conventional conservation methods alone have proven insufficient to halt biodiversity loss, emphasizing the need for integrated conservation strategies that combine ecological, technological, socioeconomic, and policy-based approaches. This paper synthesizes current knowledge on the conservation of endangered medicinal flora by integrating in situ and ex situ conservation, biotechnology, sustainable harvesting, community participation, legal frameworks, climate resilient management, and digital technologies. It highlights the role of tissue culture, cryopreservation, molecular markers, DNA barcoding, GIS based habitat monitoring, artificial intelligence, and community based conservation in safeguarding medicinal plant diversity. The paper further discusses challenges, future prospects, and strategic recommendations for ensuring the long term conservation and sustainable utilization of endangered medicinal plant species. An integrated multidisciplinary framework is proposed to reconcile biodiversity conservation with human healthcare and rural livelihoods.

Keywords: *Medicinal plants, Biodiversity conservation, In situ conservation, Ex situ conservation, Sustainable utilization, Climate change.*

Introduction

Medicinal plants have been important sources of healthcare for thousands of years and continue to support both traditional and modern medicine. Herbal medicine remains widely used globally, while pharmaceuticals such as aspirin, quinine, vincristine, paclitaxel, and artemisinin demonstrate the therapeutic and scientific value of medicinal flora (WHO, 2025). However, medicinal plants face increasing threats from deforestation, urbanization, agricultural expansion, habitat fragmentation, overexploitation, illegal trade, indiscriminate harvesting, climate change, pollution, and invasive species. These pressures have resulted in declining populations of several rare, endemic, and economically important species (Khakurel et al., 2024). Conventional protected-area approaches alone may be insufficient because medicinal plant conservation is closely linked with ecological, socioeconomic, and cultural factors. efforts. Integrating scientific research with indigenous knowledge can promote sustainable resource management while supporting local livelihoods. This paper examines major threats to endangered medicinal flora and discusses integrated ecological, technological, socioeconomic, and policy-based strategies for their conservation and sustainable utilization. Climate change further affects species distribution, phenology, habitat suitability, and secondary metabolite production, highlighting the need for climate-responsive strategies (Mykhailenko et al., 2025). Therefore, effective conservation requires an integrated approach combining *in situ* and *ex situ* conservation, habitat restoration, sustainable harvesting and cultivation, community participation, biotechnology, germplasm preservation, and supportive policies. Modern techniques such as tissue culture, micropropagation, cryopreservation, molecular characterization, and digital monitoring can strengthen conservation

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Figure 1: Integrated Approaches for the Conservation and Sustainable Utilization of Endangered Medicinal Plants.

Importance of Medicinal Flora

Medicinal plants provide important ecological, pharmaceutical, economic, and healthcare benefits and are essential components of terrestrial ecosystems. They support biodiversity and preserve genetic diversity, enabling plant species to adapt to changing environmental conditions (Davis & Choisy, 2024). Many medicinal plants provide food, nectar, pollen, and shelter for pollinators such as bees, butterflies, and birds, thereby supporting pollination and ecosystem functioning. Their root systems help prevent soil erosion, improve soil structure, and enhance water retention, while plant litter contributes to soil fertility and nutrient cycling.

Medicinal Flora are also major sources of bioactive compounds used in modern medicine. Approximately **25–30% of pharmaceutical drugs** are derived directly or indirectly from plant sources. Secondary metabolites such as alkaloids, flavonoids, terpenoids, glycosides, and phenolics exhibit antimicrobial, anti-inflammatory, anticancer, antidiabetic, and antioxidant properties (Pramanik et al., 2024). Important examples include vincristine, paclitaxel, artemisinin, and reserpine, derived from medicinal plants and used therapeutically. Therefore, conserving endangered medicinal flora is crucial for maintaining ecosystem stability, protecting genetic resources, supporting traditional and modern healthcare, and ensuring opportunities for future pharmaceutical discoveries. Sustainable utilization further helps balance biodiversity conservation with human healthcare and livelihood needs.

Table 1: Medicinal Plants of Pharmaceutical Importance (Latif et al, 2025; Aggarwal, G., et al 2024; Gusain, P., et al 2026)

Medicinal Plant	Active Compound(s)	Major Therapeutic Use	Conservation Relevance
Catharanthus roseus	Vincristine, Vinblastine	Cancer treatment	Sustainable cultivation and protection of wild populations are important due to pharmaceutical demand.
Taxus wallichiana	Paclitaxel-related taxanes	Anticancer therapy	Overharvesting of bark and slow regeneration make conservation and sustainable harvesting essential.
Rauvolfia serpentina	Reserpine	Hypertension and cardiovascular disorders	Wild populations are threatened by excessive collection, requiring cultivation and habitat protection.
Artemisia annua	Artemisinin	Malaria treatment	Conservation of genetic diversity and sustainable cultivation support continued availability of artemisinin.
Withania somnifera	Withanolides	Adaptogenic and traditional medicine	Increasing commercial demand highlights the need for controlled harvesting and cultivation.

Causes of Endangerment

Medicinal plants are increasingly threatened by habitat destruction, deforestation, overharvesting, illegal trade, climate change, pollution, and the expansion of agriculture and urbanization. These pressures reduce natural populations, genetic diversity, and habitat availability, increasing the risk of extinction for rare and economically valuable medicinal species.

1 Habitat Loss

Habitat loss is a major threat to endangered medicinal plants, particularly in regions experiencing rapid agricultural expansion, urbanization, mining, and

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infrastructure development. The destruction and fragmentation of forests and natural ecosystems reduce the availability of suitable sites for plant growth, reproduction, and regeneration (Kumar et al, 2026). As habitats become smaller and isolated, plant populations may decline and lose genetic diversity, increasing their vulnerability to environmental changes, pests, diseases, and other pressures. Therefore, habitat protection and restoration are essential conservation strategies.

2 Overexploitation

Overexploitation is a significant cause of medicinal plant endangerment, resulting from excessive and uncontrolled harvesting for traditional medicine, commercial trade, and pharmaceutical purposes. The collection of roots, bark, rhizomes, leaves, flowers, and entire plants can severely damage individual plants and reduce their ability to regenerate (Aggarwal, G., et al 2024). Repeated harvesting from natural populations also decreases population size and genetic diversity. Promoting sustainable harvesting techniques, regulated collection, cultivation, and community participation can help reduce pressure on threatened medicinal plant species.

3 Climate Change

Climate change significantly affects the growth, reproduction, and survival of medicinal plants by altering temperature, rainfall patterns, and seasonal cycles. These environmental changes can disrupt flowering, seed production, germination, and natural regeneration. Changes in climate may also shift the geographical distribution of plant species and reduce suitable habitats (Mykhailenko, O., et al 2025). As medicinal plants struggle to adapt to rapidly changing conditions, their populations may decline, increasing their risk of endangerment and threatening the availability of valuable medicinal resources.

4 Illegal Trade

The increasing demand for herbal medicines and pharmaceutical products has intensified the exploitation of medicinal plants. Excessive harvesting from natural habitats, particularly for commercially valuable species, can rapidly reduce wild populations. Illegal collection and trade further worsen this problem by removing plants without proper regulation or sustainable management. Continuous overharvesting prevents natural regeneration and damages ecosystems. As a result, many medicinal plant species face declining populations, habitat pressure, and an increased risk of becoming endangered or extinct (WHO, 2025).

5 Invasive Species

Invasive species are an important cause of endangerment among medicinal plants because they compete directly with native flora for essential resources. Invasive alien plants often grow rapidly and consume sunlight, water, nutrients, and available space, limiting the growth and regeneration of native medicinal species. Their spread can also disturb natural habitats, alter ecosystem processes, and reduce biodiversity. Consequently, vulnerable medicinal plants may experience population decline, habitat loss, and reduced chances of long-term survival in their natural environments (Roy, H. E et al, 2023).

6 Genetic Erosion

Genetic erosion is a significant cause of endangerment in medicinal plants, particularly when populations become small, isolated, and fragmented. Limited gene flow and increased inbreeding can reduce genetic diversity within these populations. Low genetic variation weakens the ability of medicinal plants to adapt to changing environmental conditions, emerging diseases, pests, and other ecological stresses (Gusain, P., et al, 2021). Over time, reduced adaptability may decrease plant growth, reproduction, and survival, increasing vulnerability to population decline and possible extinction.

4. Integrated Conservation Strategies

Integrated conservation strategies combine in-situ and ex-situ conservation, habitat restoration, sustainable harvesting, and community participation to protect endangered medicinal flora. These approaches also promote scientific research, cultivation, monitoring, and effective policy implementation for the long-term survival of medicinal plant species.

1 In Situ Conservation

In situ conservation is an effective strategy for protecting endangered medicinal flora by conserving plant species within their natural habitats. It enables plants to survive, reproduce, and adapt under natural ecological conditions while preserving genetic diversity, ecological interactions, and evolutionary processes. Protected areas such as biosphere reserves, national parks, wildlife sanctuaries, and Medicinal Plant Conservation Areas (MPCAs) provide secure habitats and support natural regeneration, population monitoring, research, and sustainable management. Traditional approaches, including sacred groves and community forests, further strengthen conservation through local participation and sustainable resource use. In situ conservation also maintains important relationships among medicinal plants, pollinators, soil organisms, and other ecosystem components. However, its effectiveness is challenged by climate change, habitat loss, deforestation, grazing, forest fires, infrastructure development, human encroachment, and illegal harvesting (Dadhich, M. K., et al, 2024). Therefore, regular monitoring, habitat restoration, community participation, and sustainable management are essential for strengthening in situ conservation and ensuring the long-term survival of endangered medicinal plants.

Table 2. Integrated In Situ Conservation Strategies for Endangered Medicinal Flora (Prasathkumar, M., et al, 2021; Dadhich, M. K., et al, 2024).

Conservation Approach	Conservation Role and Significance	Examples of Medicinal Plants	Major Conservation Benefits
Biosphere Reserves	Protect large natural ecosystems where endangered medicinal plants survive under natural conditions.	*Nardostachys jatamansi* (Jatamansi), *Saussurea costus*	Maintains natural ecosystems, conserves genetic diversity, and

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	They integrate biodiversity conservation, sustainable resource use, research, education, and community participation.	(Kuth), *Rauvolfia serpentina* (Sarpagandha)	supports research and sustainable resource use.
National Parks	Provide legally protected habitats by restricting deforestation, excessive grazing, illegal harvesting, and other destructive activities.	*Aconitum heterophyllum* (Atis), *Picrorhiza kurroa* (Kutki), *Taxus wallichiana* (Himalayan Yew)	Protects natural habitats, maintains ecological balance, and supports regeneration of threatened species.
Wildlife Sanctuaries	Conserve medicinal plants alongside wildlife by protecting natural habitats and reducing human-induced disturbances.	*Tinospora cordifolia* (Guduchi), *Adhatoda vasica* (Vasaka), *Withania somnifera* (Ashwagandha)	Ensures habitat protection, supports natural regeneration, and conserves biodiversity.
Medicinal Plant Conservation Areas (MPCAs)	Specially designated areas established to conserve threatened medicinal plants in their natural habitats, with emphasis on genetic diversity, regeneration, and scientific monitoring.	*Rauvolfia serpentina* (Sarpagandha), *Saraca asoca* (Ashoka), *Terminalia arjuna* (Arjuna)	Conserves genetic resources, promotes natural regeneration, and supports research and monitoring.
Sacred Groves	Forest patches protected by local communities through religious and cultural traditions. These relatively undisturbed habitats provide refuges for rare medicinal plants.	*Saraca asoca* (Ashoka), *Ficus religiosa* (Peepal), *Azadirachta indica* (Neem)	Preserves rare species, protects biodiversity, and maintains traditional conservation practices.
Community Forests	Managed by local communities through participatory conservation practices that encourage protection of medicinal plants and sustainable harvesting.	*Phyllanthus emblica* (Amla), *Terminalia chebula* (Haritaki), *Asparagus racemosus* (Shatavari)	Promotes community participation, sustainable use, and long-term conservation.
Maintains Ecological Interactions	Conserves natural relationships among medicinal plants, soil organisms, pollinators, herbivores, and other ecosystem components.	*Rauvolfia serpentina*	Maintains ecosystem stability and supports natural plant regeneration.
Preserves Evolutionary Processes	Allows medicinal plants to naturally adapt and evolve in response to environmental changes and ecological pressures.	*Aconitum heterophyllum*	Strengthens natural adaptation and long-term survival.
Conserves Genetic Diversity	Protects naturally occurring genetic variation within medicinal plant populations, improving their ability to withstand environmental stresses.	*Saraca asoca*	Maintains genetic resources and adaptive potential.
Supports Pollinators	Maintains habitats for bees, butterflies, birds, and other organisms essential for flowering, reproduction, and regeneration.	*Asparagus racemosus*	Enhances pollination, reproduction, and population recovery.

4.2 Ex-Situ Conservation

Ex situ conservation is an important complementary strategy for protecting endangered medicinal flora outside their natural habitats. It provides secure conditions for preserving threatened species, genetic diversity, and valuable germplasm when wild populations decline. Botanical gardens maintain living collections for research, education, propagation, and reintroduction, while seed banks enable long-term storage of orthodox seeds under controlled conditions. Field gene banks are useful for species with recalcitrant seeds, whereas tissue culture and micropropagation facilitate rapid multiplication of rare and disease-free plant material. Cryopreservation allows long-term storage of embryos, shoot tips, and other tissues at extremely low temperatures. Synthetic seed technology also supports storage and transportation of propagules (Zeng, L., et al, 2024). These methods reduce extinction risks and provide material for habitat restoration. However, ex situ conservation should complement, rather than replace, habitat protection. Integrating ex situ collections with in situ conservation, genetic monitoring, and reintroduction programmes provides a comprehensive approach to long-term medicinal plant conservation.

Table 3. Major Ex Situ Conservation Approaches for Endangered Medicinal Flora (Nagel, M., et al, 2024; Zeng, L., et al, 2024).)

Ex Situ Conservation Approach	Conservation Role and Significance	Examples of Medicinal Plants
Botanical Gardens	Maintain living collections of rare and endangered medicinal plants under controlled conditions. They support research, education, propagation, and conservation.	*Rauvolfia serpentina* (Sarpagandha), *Saraca asoca* (Ashoka), *Aconitum heterophyllum* (Atis)
Seed Banks	Store orthodox seeds under controlled low-temperature and moisture conditions for long-term preservation of genetic resources.	*Withania somnifera* (Ashwagandha), *Ocimum tenuiflorum* (Tulsi), *Phyllanthus emblica* (Amla)
Field Gene Banks	Maintain living plants in field collections and are particularly suitable for species producing recalcitrant seeds that cannot tolerate conventional seed storage.	*Azadirachta indica* (Neem), *Mangifera indica* (Mango), *Artocarpus heterophyllus* (Jackfruit)
Tissue Culture	Enables rapid multiplication of rare, disease-free, and genetically valuable medicinal plants under controlled laboratory conditions.	*Dendrobium* spp. (Orchids), *Rauvolfia serpentina* (Sarpagandha), *Asparagus racemosus* (Shatavari)
Cryopreservation	Provides long-term storage of embryos, shoot tips, and other plant tissues in liquid nitrogen at extremely low temperatures, helping	*Aconitum heterophyllum* (Atis), *Picrorhiza kurroa* (Kutki), *Dioscorea* spp. (Dioscorea)

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	preserve genetic material.	
Synthetic Seed Technology	Involves encapsulation of somatic embryos or other propagules in protective materials, facilitating their storage, transport, and regeneration.	*Asparagus racemosus* (Shatavari), *Dendrobium* spp. (Orchids), *Withania somnifera* (Ashwagandha)

3 Biotechnology-Based Conservation

Biotechnology-based conservation has become an important component of modern strategies for protecting endangered medicinal flora. Micropropagation enables the rapid production of healthy, disease-free planting material and supports the multiplication of rare species, commercial cultivation, and germplasm conservation. Molecular markers, including SSRs, AFLPs, RAPDs, and SNPs, are valuable tools for assessing genetic diversity, identifying genetically distinct populations, and monitoring conservation programmes. DNA barcoding facilitates accurate species authentication, detection of adulteration in medicinal plant materials, and identification of conserved germplasm. Genomic approaches, including whole-genome sequencing, can identify genes associated with environmental stress tolerance, disease resistance, and the production of important secondary metabolites. Cryobiotechnology further strengthens long-term conservation by preserving valuable and rare germplasm at ultra-low temperatures with minimal genetic change (Singh, R. K., et al, 2025). The integration of these technologies improves the identification, multiplication, characterization, and long-term preservation of endangered medicinal plants. Biotechnology therefore complements both in situ and ex situ conservation by providing scientifically advanced tools for maintaining genetic resources, supporting restoration programmes, and ensuring the sustainable availability of medicinal plant species for future generations.

Table 4. Biotechnology-Based Conservation Approaches for Endangered Medicinal Flora (Tarraf, W., et al, 2024; Nazar, N., et al, 2025).

Biotechnology Approach	Conservation Role and Applications	Examples of Medicinal Plants
Micropropagation	Produces large quantities of disease-free planting material under controlled conditions. It supports rare species multiplication, commercial cultivation, rapid regeneration, and germplasm conservation.	*Rauvolfia serpentina* (Sarpagandha), *Asparagus racemosus* (Shatavari), *Picrorhiza kurroa* (Kutki), *Dendrobium* spp. (Orchids), *Gloriosa superba* (Kalihari), *Saussurea costus* (Kuth)
Molecular Markers	SSRs, AFLPs, RAPDs, and SNPs help assess genetic diversity, identify genetically distinct populations, detect genetic variation, and support effective germplasm management.	*Withania somnifera* (Ashwagandha), *Rauvolfia serpentina* (Sarpagandha), *Ocimum tenuiflorum* (Tulsi), *Azadirachta indica* (Neem), *Bacopa monnieri* (Brahmi), *Centella asiatica* (Mandukaparni)
DNA Barcoding	Enables accurate species authentication, detection of adulteration in herbal materials, and identification and characterization of medicinal plant germplasm.	*Tinospora cordifolia* (Guduchi), *Curcuma longa* (Turmeric), *Phyllanthus emblica* (Amla), *Terminalia chebula* (Haritaki), *Adhatoda vasica* (Vasaka), *Andrographis paniculata* (Kalmegh)
Genomics	Whole-genome sequencing and genomic analysis help identify genes associated with stress tolerance, disease resistance, environmental adaptation, and production of valuable secondary metabolites.	*Catharanthus roseus* (Periwinkle), *Withania somnifera* (Ashwagandha), *Artemisia annua* (Sweet Wormwood), *Panax ginseng* (Ginseng), *Salvia miltiorrhiza* (Danshen), *Glycyrrhiza uralensis* (Licorice)
Cryobiotechnology	Preserves rare and valuable germplasm, including embryos, shoot tips, seeds, and other tissues, at ultra-low temperatures for long-term conservation with minimal genetic change.	*Aconitum heterophyllum* (Atis), *Picrorhiza kurroa* (Kutki), *Dioscorea* spp. (Dioscorea), *Nardostachys jatamansi* (Jatamansi), *Valeriana jatamansi* (Indian Valerian), *Gloriosa superba* (Kalihari)

Sustainable Utilization

Sustainable utilization is an essential component of medicinal plant conservation because long-term conservation cannot succeed without responsible and controlled use of plant resources. Rotational harvesting allows plant populations sufficient time to recover between collection periods, while partial harvesting reduces damage by avoiding complete uprooting of plants. Harvesting after seed maturation supports natural regeneration and maintains future populations. Cultivation of medicinal plants can reduce pressure on wild populations by providing a reliable source of raw materials. Good Agricultural and Collection Practices (GACP) promote proper cultivation, harvesting, processing, and quality control. Organic cultivation minimizes the harmful effects of synthetic chemicals, while agroforestry integration combines medicinal plants with trees and agricultural crops, improving biodiversity, soil health, and sustainable land use (Alum, E. U., 2025). Together, these practices balance the economic and medicinal value of plant resources with their ecological conservation, ensuring their availability for present and future generations.

Community Based Conservation

Community based conservation is essential for protecting endangered medicinal flora by involving local communities in sustainable resource management. Indigenous knowledge provides valuable information on plant identification, medicinal uses, habitats, and harvesting practices. Activities such as village biodiversity registers, herbal gardens, joint forest management, sustainable harvesting training, benefit-sharing, women's self-help groups, and documentation of traditional knowledge strengthen local stewardship and

reduce destructive harvesting. Herbal gardens and community cultivation can reduce pressure on wild populations, while processing and marketing of medicinal plants create livelihood opportunities. Integrating traditional knowledge with scientific conservation methods promotes biodiversity protection, supports rural communities, and provides an inclusive and sustainable approach to the long-term conservation of endangered medicinal plants.

Policy and Legal Frameworks

Effective conservation of endangered medicinal flora requires strong policy, legislation, and institutional support at international, national, and regional levels. Important frameworks include the Convention on Biological Diversity (CBD), Nagoya Protocol, CITES, Global Strategy for Plant Conservation, National Biodiversity Act, National Medicinal Plants Board in India, and State Biodiversity Boards. These frameworks provide guidelines for protecting biodiversity, regulating trade, and promoting sustainable use of medicinal plant resources (Mahajan, B., 2025). Policies should encourage sustainable cultivation, quality certification, supply-chain traceability, farmer incentives, and fair access and benefit-sharing mechanisms. Strong implementation, monitoring, and community participation can further improve conservation outcomes and sustainable medicinal plant management.

Climate Smart Conservation

Climate smart conservation is essential for protecting endangered medicinal flora from the increasing impacts of climate change. Adaptive strategies can improve the resilience and long-term survival of vulnerable plant species. Climate-resilient medicinal plant cultivation can help maintain production under changing temperature and rainfall conditions. Assisted migration, where scientifically appropriate, may support species whose natural habitats are becoming unsuitable (Mahajan, B., 2026). Ecological restoration can recover degraded habitats, while habitat connectivity enables plants and associated organisms to shift across suitable areas. Long-term ecological monitoring helps identify population changes and emerging threats. Predictive species distribution modelling can further identify future suitable habitats and guide effective conservation planning and management.

Role of Digital Technologies

Emerging digital tools are transforming the conservation of endangered medicinal plants by improving habitat assessment, species monitoring, and conservation planning. Geographic Information Systems (GIS) help map species distributions, identify biodiversity-rich areas, and support landscape-level planning. Remote sensing and satellite data enable monitoring of forest cover, habitat degradation, fragmentation, and environmental changes over large areas. Artificial Intelligence (AI) and machine-learning techniques assist in plant species identification, disease detection, habitat-suitability prediction, and conservation **prioritization.** Digital herbaria provide electronic records that strengthen taxonomy, biodiversity research, education, and information sharing (Mahajan, B., 2025; Roopashree, S., et al, 2024). The integration of these technologies enables efficient monitoring, better data management, early threat detection, and evidence-based conservation decisions for endangered medicinal flora.

Integrated Conservation Framework

Effective conservation of endangered medicinal flora requires integrating ecological protection, biotechnology, community participation, sustainable harvesting, policy support, climate adaptation, and digital monitoring (Mahajan, B.,2026). This holistic approach protects habitats, preserves genetic resources, reduces pressure on wild populations, strengthens local stewardship, and improves climate resilience. Together, these strategies support long-term conservation and sustainable utilization of medicinal plants.

Challenges

The conservation of endangered medicinal flora faces several challenges that limit the effectiveness of existing strategies. Insufficient funding restricts conservation programmes, scientific research, habitat restoration, and long-term monitoring. Weak enforcement of conservation laws can allow illegal harvesting and unsustainable trade to continue. Limited taxonomic expertise makes accurate identification and assessment of threatened plant species difficult. Climate uncertainty further complicates conservation planning by creating unpredictable environmental conditions. Habitat fragmentation reduces plant populations and disrupts ecological processes. Inadequate public awareness can increase unsustainable resource use, while poor coordination among government agencies, researchers, local communities, and other stakeholders reduces the effectiveness of conservation initiatives. Addressing these challenges requires stronger institutions, adequate financial support, scientific capacity, community participation, effective law enforcement, and coordinated long-term conservation planning.

Future Perspectives

Future research on the conservation of endangered medicinal flora should focus on integrating advanced scientific technologies with ecological and community-based approaches. Genomic conservation can help identify and preserve valuable genetic resources, while AI-assisted biodiversity monitoring can improve species identification, population assessment, and habitat surveillance. Metabolomics-guided conservation may support the identification of medicinally important compounds and prioritize valuable plant populations. Precision cultivation and climate-resilient breeding can improve productivity while reducing pressure on wild populations. Synthetic biology may provide new opportunities for producing important medicinal compounds sustainably. Citizen science can strengthen monitoring and public participation, while blockchain-based traceability can improve transparency in medicinal plant supply chains. Interdisciplinary collaboration among ecologists, botanists, pharmacologists, policymakers, biotechnologists, and local communities will

be essential for developing effective, scientifically informed, and socially inclusive conservation strategies.

Conclusion

The conservation of endangered medicinal flora is essential for safeguarding biodiversity, ensuring future healthcare resources, and supporting sustainable livelihoods. An integrated conservation strategy that combines in situ and ex situ methods with biotechnology, sustainable harvesting, community participation, supportive policies, and climate-adaptive management offers the most effective pathway for preserving these valuable resources. Advances in tissue culture, cryopreservation, molecular genetics, geospatial technologies, and artificial intelligence provide powerful tools to complement traditional conservation practices. At the same time, recognizing indigenous knowledge, promoting equitable benefit sharing, and encouraging cultivation can reduce pressure on wild populations. Collaborative action among researchers, governments, conservation organizations, industry, and local communities is critical to securing the long-term survival and sustainable utilization of endangered medicinal plants for future generations.

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The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Original Article

History and Politics in the Novels of Salman Rushdie

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Abstract

This research paper explores the profound and intricate intersection of history and politics within the fictional works of Salman Rushdie, one of the most prominent and controversial voices in contemporary postcolonial literature. Spanning major novels such as Midnight's Children, Shame, The Moor's Last Sigh, and The Satanic Verses, Rushdie's writing challenges conventional historical timelines and linear narratives through magical realism, satire, and mythological framing. By examining how Rushdie reimagines national foundational myths, deconstructs authoritarian regimes, and interrogates the displacement of minority communities, this study highlights his unique contribution to understanding modern postcolonial statehood. The paper analyzes how personal identities become inextricably bound to political upheavals, partition traumas, and ideological dogmatisms. Furthermore, it investigates the tension between official state history and subaltern, forgotten narratives, demonstrating how Rushdie uses fiction as a democratic space to voice dissent. Ultimately, this research reveals that Rushdie's novels are not merely artistic escapes, but vital political interventions that expose the fragile mechanisms of power, nationalism, and religious extremism in the modern world.

Keywords: *Salman Rushdie, Postcolonialism, Magical Realism, National History, Politics, Identity.*

Introduction

Literature and history have always shared a complex relationship. While history is traditionally viewed as an objective record of past events, documented through archives, treaties, and official state chronicles, literature offers an imaginative reinterpretation of those same realities. In the context of postcolonial literature, this relationship becomes even more urgent and contentious. Postcolonial writers often find that official histories have been written by colonizers or ruling elites, silencing marginalized voices and glossing over the violent ruptures of decolonization. Among contemporary authors, Salman Rushdie stands out as a master craftsman who dismantles official histories and exposes the raw political machinery behind nation-building. Born in Bombay in 1947—the exact year of Indian independence and Partition—Rushdie's life and work are deeply intertwined with the political birth pangs of the Indian subcontinent. His novels do not merely describe historical events as a passive backdrop; instead, they treat history as a fluid, contested text that can be rewritten, questioned, and satirized. Through techniques such as magical realism, hyperbole, fragmented timelines, and dark humor, Rushdie challenges the grand narratives imposed by nation-states and political leaders. He demonstrates how political power relies on mythological framing, censorship, and the suppression of inconvenient truths. This research paper provides a comprehensive exploration of history and politics across Rushdie's major novels. It investigates how he portrays the tragedy of Partition, the rise of authoritarianism in South Asia, the cultural hybridity of migrant experiences, and the ongoing struggle between religious fundamentalism and secular democracy. By breaking down historical linearity, Rushdie opens up a space where subaltern stories, private memories, and public politics collide.

Midnight's Children: Deconstructing the Grand Narrative of Indian Independence

Published in 1981, Midnight's Children catapulted Salman Rushdie to international acclaim and fundamentally transformed postcolonial fiction. The novel follows Saleem Sinai, who is born at the exact stroke of midnight on August 15, 1947—the historic moment India gained independence from British rule.

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Saleem's life is mystically bound to the destiny of the newly born nation: his personal triumphs and physical ailments mirror the political victories and crises of India. Through this allegory, Rushdie immediately establishes a core thematic concern: the intimate, inescapable connection between individual identity and national politics. One of Rushdie's most revolutionary contributions in Midnight's Children is his critique of linear history. Official national history often presents independence as a clean, glorious break from colonial oppression, achieved through noble statesmanship. Rushdie subverts this sanitized version of history. Saleem's narration is famously fragmented, leaky, and unreliable—he suffers from a literal cracking in his head, symbolizing the fractures and contradictions within the Indian nation. By framing history through memory and subjective storytelling ('To understand me, you'll have to swallow a world'), Rushdie asserts that history is not a fixed monument, but a process of ongoing interpretation. Furthermore, the midnight children themselves—possessing magical powers and representing the diverse linguistic, cultural, and religious fabric of India—serve as a microcosm of the Nehruvian dream of 'unity in diversity.' However, as the novel progresses through the tumultuous decades of the 1950s and 1960s, this dream begins to unravel. The children's conference dissolves into internal squabbling and ideological division, reflecting the real-world political fractures of the subcontinent, including linguistic riots, regional separatist movements, and the Indo-Pakistani wars. The political climax of Midnight's Children arrives with the declaration of the Emergency by Prime Minister Indira Gandhi in 1975. Rushdie portrays the Emergency as the darkest manifestation of authoritarian power, where democratic institutions were suspended, political dissidents were imprisoned, and marginalized populations were subjected to forced sterilization and slum clearance. In the novel, the midnight children are rounded up and sterilized by the state, symbolizing the brutal suppression of plurality and independent thought by a paranoid government. Through this powerful allegory, Rushdie critiques how postcolonial nation-states, initially forged in the democratic ideals of freedom, frequently degenerate into tyranny and intolerance.

Shame: Exploring Authoritarianism and Political Pathology in Pakistan

If Midnight's Children explores the sprawling, chaotic mosaic of Indian nationhood, Rushdie's subsequent novel, Shame (1983), turns its satirical gaze toward Pakistan. Written in the wake of political upheaval, martial law, and the execution of Zulfikar Ali Bhutto, Shame examines the psychological and political landscape of a country defined by military dictatorship and religious orthodoxy. Rushdie deliberately presents Pakistan not as a realistic geopolitical entity, but as a 'fairy-tale' or 'palimpsest' country—Peccavistan—to expose the absurdities and violent contradictions underpinning its creation. The central thematic pillar of the novel is 'shame' and its psychological counterpart, 'shamelessness.' Rushdie argues that Pakistan was born out of a collective sense of historical and religious insecurity—a nation created as a homeland for Muslims of the Indian subcontinent, yet plagued by deep internal divisions regarding what kind of Islamic state it should be. This foundational anxiety manifests in public life as rampant corruption, military coups, and the systemic oppression of women and minorities. Through the characters of General Raza Hyder (representing military dictatorship, modeled after General Zia-ul-Haq) and Iskander Harappa (representing civilian political corruption, modeled after Bhutto), Rushdie dissects the toxic dance between military might and civilian ambition. He illustrates how political leaders manipulate religious fervor to legitimize their authoritarian rule while silencing democratic opposition. The novel demonstrates that when a state is built primarily on negative definitions—what it is against rather than what it stands for—it inevitably breeds violence and internal repression. Moreover, Shame highlights the plight of women in patriarchal political systems. Characters like Sufiya Zinobia Hyder embody the accumulated shame of a repressed society. When societal pressures and state violence reach a boiling point, Sufiya undergoes a monstrous metamorphosis, transforming into a violent beast that destroys the corrupt patriarchs around her. Through this magical realist trope, Rushdie suggests that the violence a state inflicts upon its citizens —and particularly upon its most vulnerable groups—will ultimately return to consume the state itself.

The Satanic Verses: Migration, Diaspora, and Religious Orthodoxy

Published in 1988, The Satanic Verses remains Salman Rushdie's most globally debated and politically explosive novel. While the unprecedented controversy surrounding the book—culminating in the fatwa issued by Ayatollah Ruhollah Khomeini of Iran—overshadowed its literary reception for years, the novel itself is a brilliant, multifaceted exploration of migration, cultural hybridity, religious dogma, and political fanaticism in the contemporary world. The narrative follows two Indian Muslim actors, Gibreel Farishta and Saladin Chamcha, who plummet from a hijacked airplane onto the shores of Thatcherite Britain. Through their experiences, Rushdie examines the harsh political realities faced by immigrants in Western societies: institutional racism, police brutality, economic marginalization, and the pressure to either assimilate completely or be cast as perpetual outsiders. Chamcha, who initially tries to shed his Indian identity to become thoroughly English, experiences a literal and metaphorical metamorphosis into a horned beast, highlighting the dehumanizing nature of xenophobic state policies. Parallel to the contemporary London narrative, the novel features dream sequences concerning the founding of Islam, specifically focusing on the prophet Mahound (a historical polemical name for Muhammad) and the controversial 'satanic verses' episode. Rushdie uses these dream sequences to explore how religious texts are compiled, how sacred authority is established, and how spiritual revelations become institutionalized political dogmas. He questions the absolute infallibility of religious

law, arguing that faith and history are subject to human interpretation and political manipulation. The political fallout of The Satanic Verses demonstrated the immense power of globalized religious fundamentalism and the vulnerability of artistic freedom in an interconnected world. The book became a battleground where questions of free speech, blasphemy, minority rights, and cultural sensitivity clashed violently. Rushdie's novel thus serves as both a prophetic warning about the rise of religious extremism and a testament to the resilience of the migrant imagination against dogmatic intolerance.

The Moor's Last Sigh: Art, History, and the Rise of Right-Wing Regionalism

In his 1995 novel The Moor's Last Sigh, Rushdie shifts his focus toward the late-twentieth-century political transformations in India, particularly the rise of militant Hindu nationalism (Hindutva), communal violence, and the erosion of India's traditional secular fabric. The novel spans four generations of the Da Gama-Zogoiby family in Cochin and Bombay, narrated by Moraes Zogoiby ('The Moor'), who ages at twice the normal rate and suffers from a deformed hand. The Moor's life mirrors the turbulent political history of modern India, moving from the cosmopolitan optimism of post-independence Bombay to the dark sectarian riots of the early 1990s. Rushdie paints a vivid picture of Bombay as a vibrant, hybrid metropolis where diverse cultures, religions, and histories intermingled. However, this pluralistic ideal comes under severe threat from rising religious fundamentalism and criminal-political syndicates. A central political figure in the novel is Ramanand Fielding, a thinly veiled caricature of extremist political leaders who mobilize mobs under the banner of religious chauvinism. Fielding preaches a narrow, exclusionary vision of the nation that demands absolute conformity and seeks to purge minority populations. Rushdie warns that such right-wing politics destroy the rich cultural mosaic of the nation, replacing diversity with uniformity and tolerance with terror. Through the canvas painted by Aurora Zogoiby—Moor's mother and a brilliant artist—the novel explores how art can serve as both a record of history and a political weapon. Aurora's final masterwork, depicting a nightmarish, fragmented vision of the nation, captures the trauma of communal riots and the betrayal of the secular ideal. The Moor's Last Sigh stands as a passionate defense of hybridity and a sobering critique of how sectarian politics hijack national history.

Comparative Analysis: Key Political Motifs Across Rushdie's Oeuvre

Across his diverse fictional universe, Rushdie consistently returns to several core political and historical motifs. Examining these motifs side by side reveals a coherent political philosophy that critiques dogmatism in all its forms—whether colonial, nationalist, religious, or ideological.

Novel	Historical Context	Key Political Theme
Midnight's Children	Indian Independence & Emergency (1947–1975)	Deconstruction of national grand narratives; authoritarian overreach.
Shame	Pakistani Martial Law & Political Instability	Pathology of dictatorship, collective shame, and patriarchal state violence.
The Satanic Verses	Thatcherite Britain & Islamic Fundamentalism	Migrant identity, racism, censorship, and religious dogma.
The Moor's Last Sigh	Rise of Hindu Nationalism & Bombay Riots	Erosion of secular pluralism and sectarian violence.

As demonstrated in the table above, Rushdie uses specific historical backdrops not merely as decorative scenery, but as testing grounds for human agency under political pressure. Whether it is Saleem Sinai navigating the state censorship of the Emergency, or Saladin Chamcha confronting institutional racism in Britain, Rushdie's protagonists are caught in the grinding gears of macro-history.

Conclusion

Salman Rushdie occupies a unique and monumental place in modern world literature. Through his daring fusion of history, politics, and magical realism, he has fundamentally reshaped how we understand postcolonial identity and nationhood. His novels consistently remind us that history is never neutral or settled; it is always open to contestation, revision, and storytelling. By giving voice to the marginalized, exposing the hypocrisies of political leaders, and celebrating cultural hybridity, Rushdie champions the democratic imagination against all forms of authoritarian closure. In an era marked by rising nationalism, religious extremism, sectarian violence, and restrictions on freedom of expression, Rushdie's work remains profoundly relevant. His literary crusade against dogma teaches us that the best defense against political tyranny is a vibrant, critical culture that refuses to accept single-minded, monolithic narratives. Ultimately, Rushdie's novels stand as enduring testaments to the power of literature to question authority, honor human complexity, and imagine a more inclusive world.

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Original Article

A Study on Financial Reconciliation and the Identification of Error and Mismatch in Accounting Transaction at Sekharan Associates

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ABSTRACT

Financial reconciliation is an important process in accounting that helps organizations maintain accuracy, transparency, and reliability in financial reporting. Reconciliation procedures are used to compare accounting records with supporting financial documents in order to identify mismatches, errors, omissions, and discrepancies in transactions. Effective reconciliation practices help organizations ensure compliance with financial regulations and improve internal financial control. The present study titled "A Study on Financial Reconciliation and the Identification of Errors and Mismatches in Accounting Transactions at Sekharan Associates" focuses on analyzing reconciliation procedures and identifying accounting mismatches through practical exposure gained during the internship at a Chartered Accountant audit office. The study mainly concentrates on GST reconciliation, Input Tax Credit (ITC) verification, bank reconciliation, accounts payable reconciliation, tax rate verification, and mismatch detection in accounting transactions. The study adopted both descriptive and analytical research design. Data for the study were collected through observation method, company financial records, GST returns, ledger statements, bank statements, reconciliation reports, and discussions with accounting professionals. Microsoft Excel and reconciliation statements were mainly used for data analysis and comparison. The analysis identified several reconciliation issues such as incorrect invoice entries, duplicate transactions, missing invoices, GST mismatches, tax classification errors, supplier non-compliance, and timing differences in bank reconciliation. The study revealed that manual data entry mistakes and delayed verification procedures were the major causes of accounting discrepancies. The findings emphasize that regular reconciliation procedures improve accounting accuracy, strengthen GST compliance, reduce financial risks, and enhance transparency in financial reporting. The study also suggests that adoption of automated reconciliation systems, periodic verification, and stronger internal controls can significantly improve reconciliation efficiency and minimize accounting errors. Overall, the study provides practical understanding of financial reconciliation procedures and highlights the importance of effective mismatch detection mechanisms in maintaining reliable accounting records and ensuring proper financial management.

Keywords: *Financial Reconciliation; Accounting Errors; Mismatch Detection; GST Reconciliation; Input Tax Credit (ITC); Bank Reconciliation; Accounts Payable; GST Compliance; Tax Rate Verification; HSN Classification; Internal Financial Control; Financial Accuracy; Accounting Discrepancies; Reconciliation Efficiency; Financial Transparency.*

Introduction

Financial reconciliation plays a significant role in identifying and rectifying these accounting discrepancies. It improves financial accuracy, strengthens internal controls, supports audit procedures, and ensures compliance with accounting standards and statutory regulations. Reconciliation activities are commonly performed for bank accounts, vendor accounts, customer accounts, GST records, ledger balances, and intercompany transactions. The present study titled "A Study on Financial Reconciliation and the identification of Error and Mismatch Detection in Accounting Transactions in Sekharan Associates" focuses on understanding the reconciliation procedures followed in accounting practices and identifying the common accounting mismatches that occur during transaction processing. The study also examines the methods used for detecting errors and maintaining financial accuracy within organizations.

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In the modern accounting environment, businesses increasingly rely on accounting software and enterprise systems such as Tally, SAP, Oracle, and cloud-based accounting platforms. Although these systems reduce manual effort and improve efficiency, reconciliation issues may still arise due to improper data entry, incomplete documentation, delayed recording of transactions, or communication gaps between departments. Therefore, effective reconciliation practices remain essential even in computerized accounting systems. The study highlights the importance of financial reconciliation in maintaining transparency, reducing financial risk, preventing fraud, and improving operational efficiency. It also emphasizes how reconciliation supports auditors and finance professionals in verifying accounting records and ensuring the reliability of financial statements. Thus, this study aims to analyze the process of financial reconciliation and evaluate the methods adopted for identifying and correcting errors or mismatches in accounting transactions.

Objectives of the Study

1. To study the financial reconciliation procedures followed in the organization.
2. To identify accounting errors and mismatches in financial transactions.
3. To analyze GST reconciliation and Input Tax Credit verification procedures.
4. To examine differences between accounting records and GST returns.
5. To study bank reconciliation procedures and identify timing differences.
6. To analyze supplier reconciliation and accounts payable mismatches.
7. To evaluate the effectiveness of reconciliation practices in maintaining financial accuracy.
8. To suggest measures for improving reconciliation efficiency and reducing accounting discrepancies.

Need of the Study

: GST compliance requires proper reconciliation of returns and accounting records.

1. Incorrect reconciliation may result in tax penalties and financial misstatements.
2. Organizations need accurate accounting records for decision-making.
3. Proper reconciliation helps in identifying frauds and accounting errors.
4. Timely reconciliation improves financial transparency and operational efficiency.
5. Input Tax Credit claims must be properly verified to avoid GST compliance risks.

Scope of the Study

1. GST reconciliation
2. GSTR-1 vs Books reconciliation
3. GSTR-3B vs GSTR-1 verification
4. ITC reconciliation (GSTR-2A/2B vs GSTR-3B)
5. Tax rate and HSN verification
6. Bank reconciliation statement analysis
7. Accounts payable reconciliation
8. Detection of accounting mismatches and errors

Limitations of the Study

1. The study was limited to the reconciliation activities observed during the internship period.
2. Certain financial information was confidential and could not be fully disclosed.
3. The analysis was based on selected reconciliation records available in the audit office.
4. Time constraints limited detailed examination of all transactions.
5. The findings are specific to the selected organization and may not apply universally.
6. Some values and business names were modified for confidentiality purposes.

Research Design

Research design refers to the overall framework used for conducting the study. The present study adopted both Descriptive Research Design , Analytical Research Design

Descriptive Research Design

Descriptive research design was used to describe and explain the reconciliation procedures followed in the audit office. The study explains: GST reconciliation procedures , GSTR-1 and GSTR-3B verification , Input Tax Credit reconciliation ,Bank reconciliation process ,Accounts payable reconciliation, HSN code and tax rate verification ,Accounting practices followed during reconciliation.

Data Collection Methods

Primary Data

1. The primary data for the study were collected through:
2. Observation of reconciliation procedures
3. Practical participation in GST reconciliation activities
4. Discussions with accountants and audit staff
5. Verification of reconciliation statements
6. Analysis of mismatch reports
7. Examination of accounting records and GST returns

Secondary Data

The secondary data used for the study were collected from:

- GSTR-1 returns
- GSTR-3B returns
- GSTR-2A/2B reports
- Ledger statements
- Purchase and sales registers
- Bank statements
- Supplier statements
- Tally ERP reports
- GST provisions and reference materials
- Accounting books, journals, and websites

Tools Used for Data Collection

The following tools were used for collecting and analyzing data are Microsoft Excel , GST Portal Microsoft Excel was mainly used for: Invoice matching GST reconciliation , Data comparison, Error identification , Variance analysis .Preparation of reconciliation statements

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Sampling Design

Sampling design refers to the method used for selecting data for analysis. The study adopted a **non-probability convenience sampling method** because the reconciliation records and accounting data selected for analysis were based on availability and relevance to the study.

The sample selected for the study included GST invoices , Accounting transaction records ,Bank statements .Supplier statements .Reconciliation reports , Ledger entries ,ITC verification records , Accounts payable records,. Etc . The selected sample helped in identifying practical reconciliation mismatches and accounting errors.

Data Analysis and Interpretation

Data analysis refers to the systematic examination of reconciliation data to identify mismatches, discrepancies, and accounting errors.

The collected data were analyzed using: Descriptive analysis ,Comparative analysis ,Reconciliation analysis, Percentage analysis , Variance analysis ,Error detection technique, Tabulation method

The analysis involved:

- Comparing GSTR-1 with books of accounts
- Comparing GSTR-3B with GSTR-1
- Verifying ITC claims with GSTR-2A/2B
- Examining bank reconciliation statements
- Comparing supplier statements with ledger balances
- Identifying accounting mismatches and GST discrepancies
- Interpreting financial impact of reconciliation errors

The interpretation of data helped in understanding the causes of mismatches and evaluating reconciliation efficiency.

Discussion and Implications

GST Compliance Risk

The reconciliation exercise revealed that non-compliance with GST filing obligations — even unintentional ones — can attract significant financial penalties. Section 73 of the CGST Act provides for demand of tax, interest, and a penalty of 10% of tax amount (minimum ₹10,000) for non-fraudulent short payment. If the errors are deemed intentional, Section 74 prescribes a penalty of 100% of the tax amount. For M/s. Sri Balaji Traders, the cumulative GST risk identified in this study (short payment + excess ITC) amounts to approximately ₹28,800 in tax with additional interest exposure.

Accounting Accuracy and Financial Statements

The bank reconciliation and accounts payable errors, if left uncorrected, would directly distort the financial statements. An unrecorded ECS payment of ₹15,000 overstates bank balance and understates loan liability. An unrecorded purchase invoice of ₹30,000 understates expenses (or assets) and understates creditors — leading to an overstated profit. These misstatements, even if small individually, can cumulatively misrepresent the true financial position of the entity.

Operational Insights from the Audit Internship

The internship experience at the audit office provided firsthand exposure to the mechanics of GST reconciliation work. Key practical learnings observed include:

- GSTR-2A/2B reconciliation is performed monthly using Excel-based VLOOKUP matching of supplier GSTIN and invoice numbers — a time-intensive but critical process.
- Most errors originate not from fraudulent intent but from manual data entry mistakes, timing mismatches between accounting software and GST portal uploads, and inadequate internal review procedures.
- Small businesses often lack dedicated GST compliance staff, leading to accumulation of unresolved mismatches over multiple months.
- The GST portal's Annual Return (GSTR-9) process itself requires annual reconciliation of all monthly returns — making it essential that monthly mismatches are corrected promptly rather than carried forward.
- Tally ERP's GST reports (Outward Supply Register, ITC Ledger) serve as primary source documents during reconciliation — their accuracy is entirely dependent on correct data entry at the point of transaction.

Findings of the Study

- The reconciliation between GSTR-1 and books of accounts identified 5 mismatch cases out of 12 monthly reconciliation checks.
- Major mismatches occurred due to:
  - ✓ Invoice omission during GST filing
  - ✓ Duplicate invoice upload
  - ✓ Incorrect invoice values
  - ✓ Manual entry mistakes

1. The total difference identified during reconciliation amounted to ₹39,000.
2. Under-reporting of sales in GSTR-1 resulted in short payment of GST liability.
3. Over-reporting of invoices increased unnecessary tax liability.
4. Monthly reconciliation was not always performed immediately, which resulted in accumulation of unresolved mismatches.
5. Differences were identified between output tax reported in GSTR-1 and GSTR-3B in two months.
6. In May 2023, output tax was under-reported in GSTR-3B by ₹3,000.
7. In July 2023, excess tax of ₹8,000 was reported in GSTR-3B due to estimation and duplicate reporting.
8. Delay in finalization of accounting entries before GST filing contributed to reporting differences.
9. Inconsistent reconciliation between invoice-level returns and summary returns increased compliance risk.
10. ITC reconciliation identified excess Input Tax Credit claims in certain cases. ITC mismatches mainly occurred because:
    - ✓ Supplier invoices were not uploaded in GSTR-2A/2B
    - ✓ Ineligible credit was claimed

✓ Supplier non-compliance with GST filing

1. Excess ITC claim of ₹25,800 was identified during the reconciliation process.
2. Failure to verify supplier compliance before claiming ITC increased GST risk exposure.
3. Some suppliers delayed filing returns, affecting ITC availability for the business.
4. Tax rate and HSN mismatch analysis showed incorrect GST classification in several invoices.
5. Out of 10 invoices verified, 6 invoices contained tax rate or HSN-related errors.
6. The errors resulted in: Over-taxation , Under-taxation ,Incorrect exemption treatment
7. Lack of updated HSN reference records contributed to classification mistakes.
8. The total financial impact of tax classification errors amounted to ₹25,550.
9. Bank reconciliation identified timing differences and unrecorded transactions.
10. Outstanding cheques and deposits in transit were major causes of differences between bank statement and cash book.
11. Certain bank charges and ECS payments were not recorded in the books of accounts.
12. Interest credited by the bank was omitted from accounting records.
13. Bank reconciliation helped in identifying unrecorded entries and improving cash balance accuracy.
14. Supplier reconciliation identified differences between supplier statements and ledger balances.

The major reasons for mismatch were: Unrecorded supplier invoices

✓ Pending credit notes
✓ Unacknowledged payments
✓ Debit note disputes

Accounts payable reconciliation identified a total variance of ₹82,000.

1. Delayed communication with suppliers affected reconciliation efficiency.
2. Regular supplier confirmation was not consistently maintained.
3. Financial reconciliation plays an important role in maintaining accounting accuracy.
4. GST reconciliation helped in identifying reporting errors and tax mismatches.
5. Most accounting discrepancies were caused by manual data entry mistakes and delayed verification.
6. Excel was the primary tool used for reconciliation and comparison activities.
7. Proper reconciliation procedures improved financial transparency and reduced compliance risk.
8. Periodic reconciliation helps organizations identify discrepancies at an early stage.
9. Lack of automation increased dependency on manual verification.
10. Reconciliation procedures strengthened internal financial control.
11. GST compliance requires continuous monitoring of returns and accounting records.
12. Effective reconciliation practices improve reliability of financial statements.

Suggestions

13. Monthly GST reconciliation should be performed regularly without delay.
14. GSTR-1, GSTR-3B, and GSTR-2A/2B should be compared before filing GST returns.
15. Proper invoice verification procedures should be implemented before uploading invoices to
16. the GST portal.
17. Supplier compliance status should be monitored regularly to avoid ineligible ITC claims.
18. GST return filing should be reviewed by senior personnel before final submission.
19. ITC should be claimed only after verifying invoice availability in GSTR-2A/2B.
20. A vendor-wise ITC tracking system should be maintained.
21. Businesses should follow up with suppliers who delay GST filing.
22. Ineligible or blocked credits should be identified and avoided.
23. Proper supporting documents should be maintained for all ITC claims.
24. Updated HSN master records should be maintained.
25. Accounting staff should be trained regarding GST rate changes and HSN classification.
26. GST notifications and amendments should be reviewed periodically.
27. Tax rate verification should be included as part of internal audit procedures.
28. Automated tax classification systems may be adopted to reduce manual errors
29. Bank reconciliation statements should be prepared monthly.
30. Bank charges, interest income, and ECS transactions should be recorded immediately.
31. Outstanding cheques and deposits in transit should be monitored regularly.
32. Proper authorization and verification procedures should be maintained for banking transactions.
33. Automated bank reconciliation tools may be used to improve reconciliation efficiency
34. Supplier reconciliation should be performed periodically.
35. Supplier statements should be collected regularly for verification.
36. Pending credit notes and debit notes should be resolved quickly.
37. Proper communication should be maintained with suppliers regarding payment differences.
38. All purchase invoices should be recorded immediately after receipt.

Conclusion

The study examined various reconciliation activities including:

- GSTR-1 vs Books reconciliation
- GSTR-3B vs GSTR-1 verification
- ITC reconciliation
- Tax rate and HSN verification
- Bank reconciliation
- Accounts payable reconciliation

The analysis revealed that accounting mismatches mainly occurred due to:

- Manual data entry mistakes
- Invoice omission
- Supplier non-compliance
- Incorrect tax classification
- Delayed verification procedures
- Unrecorded banking transactions

The study highlighted the importance of periodic reconciliation in ensuring accounting accuracy, GST compliance, and financial transparency. Reconciliation procedures helped in identifying discrepancies, improving internal control, and reducing financial reporting risks. The findings indicate that adoption of systematic verification procedures, proper review mechanisms, regular reconciliation practices, and automation tools can significantly improve reconciliation efficiency and reduce accounting errors. Overall, the study provided practical understanding of financial reconciliation processes and demonstrated the importance of effective reconciliation

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Original Article

Exploring the Himalayan Landscape in the Works of Stephen Alter

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Abstract
This research paper examines the rich and multidimensional representation of the Himalayan landscape in the environmental memoirs and travel narratives of Stephen Alter. Drawing on the perspectives of ecocriticism and place-attachment theory, the study explores how Alter portrays the Himalayas not merely as beautiful natural scenery but as a living, sacred, and ecologically fragile environment. Through works such as In the Valley of the Gods, Mandakini in Retreat, All the Way to Heaven, and Becoming a Mountain, Alter combines scientific observation with spiritual understanding to depict pilgrimage routes, sacred rivers, and the geological history of the Himalayas. The paper further investigates his concern for climate change, glacial retreat, biodiversity loss, and environmental degradation, highlighting their impact on both nature and human communities. It also analyses how Alter connects mountaineering, trekking, and personal experiences—particularly his reflections on illness and recovery—to themes of resilience, self-discovery, and ecological awareness. By presenting the Himalayas as a space where nature, culture, history, and spirituality intersect, Alter encourages readers to develop a deeper respect for the environment and a stronger sense of ecological responsibility. His writings demonstrate that human identity and environmental well-being are closely connected, making the Himalayas a powerful symbol of both personal transformation and ecological sustainability.

Keywords: *Stephen Alter; Himalayan Landscape; Ecocriticism; Sacred Geography; Climate Change; Place-Attachment*

Introduction

A. Background and Context

The Himalayan mountain range has captured the human imagination for centuries, standing not merely as a physical barrier of rock, ice, and snow, but as a profound spiritual and ecological sanctuary. Stretching across multiple countries and serving as the water tower of Asia, the Himalayas inspire awe, reverence, and a deep sense of human humility. Within contemporary Indian English literature and environmental writing, few authors have engaged with this majestic landscape as intimately, rigorously, and passionately as Stephen Alter. Born in Mussoorie, India, to American missionary parents, Alter belongs to a unique lineage of writers often described as 'insider-outsiders' or Himalayan chroniclers. Having spent his formative years walking, climbing, and living among the foothills and high ridges of the Garhwal Himalayas, his entire literary corpus is deeply rooted in the ecological and cultural reality of the mountains. Alter's extensive body of work—spanning acclaimed memoirs, travel narratives, and historical explorations such as *In the Valley of the Gods, Mandakini in Retreat, All the Way to Heaven, Rain: A Natural and Cultural History, and Becoming a Mountain* transcends simple travelogues. Instead, his books function as meditative eco-literary investigations into how humans interact with fragile mountain ecosystems, how ancient myths shape modern geographical perceptions, and how physical endurance can lead to spiritual and psychological transformation. Through his precise prose, Alter records the changing climate, vanishing glaciers, forest fires, and cultural shifts altering the Himalayan landscape today. While traditional environmental literature often treats nature as a scenic backdrop or a resource to be managed, mountain landscapes present a unique theoretical challenge due to their extreme topography, spiritual resonance, and vulnerability to rapid ecological degradation.

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The central problem explored in this paper is how Stephen Alter conceptualizes the Himalayan landscape not as an inanimate object of aesthetic contemplation, but as an active participant in an ongoing ecological and cultural dialogue. Many contemporary studies overlook how eco-memoirs blend personal identity with environmental history. This research investigates how Alter bridges the gap between scientific observation and spiritual ecology, demonstrating that understanding the Himalayas requires recognizing the deep entanglement between human lives and mountain geography.

Theoretical Framework

To examine Alter's work thoroughly, this study employs an ecocritical framework combined with environmental humanities and place-attachment theory. Ecocriticism, as pioneered by scholars like Lawrence Buell and Cheryll Glotfelty, investigates the relationship between literature and the physical environment, emphasizing the ethical responsibility of human storytelling in the face of ecological crises. Place-attachment theory, developed in environmental psychology and human geography, explores how deeply rooted emotional bonds develop between individuals and specific geographical spaces. In the context of Stephen Alter's writing, these theoretical lenses help decode how his personal sense of belonging as a white American-born writer raised in India negotiates with the sacred geography of Hindu mythology, local hill communities, and the geological grandeur of peaks like Nanda Devi. Alter's work illustrates that landscape is never neutral; it is continuously shaped by memory, myth, colonial history, and modern ecological threats.

D. Research PaperStatement

This research paper argues that in his travel writing and environmental memoirs, Stephen Alter constructs the Himalayan landscape as a dynamic, sacred, and ecologically threatened entity, demonstrating that human identity in the mountains is forged through a reciprocal relationship of physical endurance, environmental observation, and deep spiritual reverence.

Literature Review

A. Critical Reception of Stephen Alter

The critical reception of Stephen Alter's work has grown steadily among scholars of postcolonial nature writing, travel literature, and Himalayan studies. Reviewers and literary critics have consistently praised his ability to combine meticulous geographical observation with lyrical, evocative prose. Unlike earlier British colonial travel writers who viewed the Himalayas through an exoticizing, imperial lens—treating the mountains as obstacles to conquer or untamed wilderness to tame—Alter writes from a deeply rooted, participatory perspective. His familiarity with local dialects, trekking routes, flora, and fauna grants his work an authenticity rarely found in transient travel accounts. Scholars of Indian English literature note that Alter occupies a fascinating liminal space. As an American whose family has lived in India for generations, his identity resists simple categorization. Critics have explored how this unique positioning allows him to bridge Western scientific inquiry and Eastern spiritual traditions without falling into romantic clichés. His recent memoirs, particularly *Becoming a Mountain*—written following a harrowing diagnosis of cancer—have received widespread acclaim for exploring how physical illness mirrors ecological vulnerability, connecting bodily healing with mountain recovery.

B. Mountain Literature and Ecocriticism

In the broader academic field of ecocriticism, mountain literature occupies a distinct and vital niche. Scholars examine how high-altitude landscapes have shifted from being viewed as terrifying, godless wastes in pre-modern European thought to being celebrated as sublime spiritual sanctuaries in romanticism, and finally recognized as fragile ecological hotspots in contemporary environmental discourse. Writers like Robert Macfarlane and Barry Lopez have explored similar themes in different topographies, but the Himalayas possess a unique density of cultural, religious, and geopolitical layers. Environmental historians and literary critics studying the Himalayas emphasize that the mountain range is deeply politicized and ecologically imperiled. Issues such as massive hydroelectric dam construction, deforestation, uncontrolled pilgrimage tourism, and global warming melting Himalayan glaciers have transformed the literature of the region. Writers can no longer afford to treat the mountains as timeless, immutable Edens; instead, they must bear witness to rapid environmental collapse.

C. Identification of the Research Gap

While individual reviews of Alter's books exist in literary journals and newspapers, there remains a lack of comprehensive, book-length ecocritical synthesis exploring how his entire narrative corpus constructs a unified philosophy of the Himalayan landscape. Much existing criticism focuses either narrowly on his mountaineering exploits or treats his memoirs as isolated travel reflections. This paper bridges that gap by synthesizing his engagement with myth, ecology, personal trauma, and geographical history into a cohesive evaluation of mountain identity.

Sacred Geography and Mythological Topography

A. The Himalayas as Abode of the Gods

One of the most striking features of Stephen Alter's writing is his profound engagement with the sacred geography of the Himalayas. For millennia, these mountains have been revered in Hindu cosmology as the home of gods, ascetics, and divine rivers. In books like *In the Valley of the Gods*, Alter explores how physical trails and ridgelines are simultaneously mapped by myth and religious pilgrimage. Every peak, cave, and confluencing river carries a story, transforming the geological landscape into a living tapestry of faith and legend. Alter does not approach these myths with detached academic skepticism or naive credulity. Instead, he demonstrates deep empathetic curiosity, walking the ancient pilgrimage routes (such as the Char Dham Yatra) to understand how pilgrims experience the landscape. He shows that for local inhabitants and millions

of visitors, the mountains are imbued with divine agency. The physical climb up a steep mountain path is mirrored by an internal spiritual ascent, where the vastness of the landscape humbles human pride and invites contemplation of the infinite.

B. Rivers of Myth and Ecology: The Mandakini and Alaknanda

Water is the lifeblood of the Himalayas, and Alter pays extraordinary attention to the sacred river systems that emerge from glacial sources. In *Mandakini in Retreat*, he follows the course of the Mandakini river, tracing its journey from high-altitude glaciers down through narrow gorges and valley settlements. The river is venerated as a goddess, yet it is also a powerful geological force shaping the terrain and sustaining millions of lives downstream. Through his descriptive prose, Alter contrasts the spiritual purity attributed to the river in sacred texts with the harsh ecological realities it faces on the ground. Silt erosion, flash floods, unscientific construction, and garbage accumulation threaten the sanctity of the waters. By weaving together mythology and environmental science, Alter shows that the cultural reverence for rivers like the Ganges, Mandakini, and Alaknanda should ideally serve as a powerful conservation ethic, though modern economic pressures frequently override ancient wisdom.

C. Alter's Perspective on Landscape as a Living Archive

For Stephen Alter, the Himalayan landscape is a living archive that records geological time alongside human history. While human empires rise and fall, and pilgrimage trails wear down into stone steps, the mountains themselves bear witness to deep time—tectonic collisions that continue to push the peaks skyward even today. Alter listens to the landscape, interpreting rock formations, ancient deodar forests, and abandoned mountain settlements as historical texts waiting to be read. This archival quality of the mountains gives Alter's writing a distinct sense of gravity. He reminds his readers that human presence in the Himalayas is fleeting. The mountains possess their own memory, recorded in glaciers, moraines, and seismic tremors. By treating the landscape as an active archive rather than a passive backdrop, Alter elevates nature writing into an exercise in profound historical and ecological listening.

IV. Ecology, Climate Change, and Environmental Vulnerability

A. Witnessing Glacial Retreat and Environmental Degradation

In his later works, Alter confronts the alarming reality of climate change and ecological collapse in the Himalayas. Often referred to as the 'Third Pole,' the Himalayan region contains the largest mass of ice outside the polar caps, feeding major river systems that sustain nearly two billion people. However, as Alter documents with sorrowful clarity, these glaciers are retreating at an unprecedented rate due to global warming, black carbon deposits, and industrial pollution. Alter walks across shrinking ice fields and observes the exposed moraines where glaciers once stood. He records how rising temperatures disrupt local weather patterns, alter traditional agricultural cycles, and increase the frequency of catastrophic flash floods and landslides. His writing shifts from purely meditative nature appreciation to urgent environmental witnessing. He forces his readers to confront the sobering truth that even the highest, most remote peaks on Earth are not immune to the destructive consequences of modern industrial civilization.

B. Deforestation, Tourism, and Commercial Pressures

Beyond climate change, Alter investigates the localized human pressures threatening Himalayan ecosystems. Uncontrolled tourism, reckless road construction, and commercial logging have severely damaged fragile hill slopes. In books like *All the Way to Heaven*, which chronicles his trek around the base of Nanda Devi—India's second-highest mountain—Alter examines how mountaineering expeditions and mass tourism leave behind garbage, disrupt wildlife corridors, and commercialize sacred spaces. Alter balances his critique of commercial exploitation with an understanding of the economic aspirations of local hill communities, who desire roads, electricity, and better livelihoods. However, he consistently warns that short-term economic gains achieved through unscientific development will ultimately result in ecological catastrophe. The hillsides, stripped of their deep-rooted forest cover, give way during monsoon rains, burying villages and blocking rivers in a recurring cycle of preventable disaster.

C. The Interdependence of Human Survival and Mountain Health

A central philosophical takeaway from Alter's environmental writings is the absolute interdependence between human survival and the health of mountain ecosystems. Modern industrial society often suffers from the illusion that humanity exists separately from nature, capable of manipulating natural resources without consequence. Alter's journeys into the high ridges consistently shatter this illusion. When the mountain forests are destroyed, soil erodes, springs dry up, and downstream cities face water scarcity and devastating floods. Alter argues that protecting the Himalayas is not an act of charity toward wildlife or distant wilderness; it is a fundamental act of self-preservation. His work issues a quiet yet passionate plea for ecological humility, urging humans to respect the natural boundaries set by the planet's most formidable mountain ranges.

V. Physical Endurance, Memoir, and Personal Transformation

A. Trekking as an Act of Inscription

For Stephen Alter, walking and climbing in the Himalayas are not merely athletic hobbies or leisure activities; they are profound acts of literary and physical inscription. In books like *All the Way to Heaven* and *Becoming a Mountain*, the physical act of placing one foot in front of the other along steep, oxygen-depleted trails becomes a method of writing oneself into the landscape. Every breath, every drop of sweat, and every step across snow and shale establishes a

direct, tactile connection between the human body and the earth. Alter views the mountain trail as a text that is read with the feet. As he climbs higher, the physical exertion strips away superficial distractions, leaving a heightened state of awareness. The landscape enters the walker's consciousness, and in return, the walker leaves a temporary, humble footprint that the mountain wind and rain soon erase. This reciprocal relationship redefines travel writing as an intimate embodiment of place.

B. Becoming a Mountain: Confronting Illness and Mortality

One of Alter's most powerful and emotionally resonant books is *Becoming a Mountain*, published after he was diagnosed with a rare and aggressive form of cancer. Facing the terrifying prospect of mortality, Alter turned to the mountains that had defined his life. He decided to undertake a challenging trek to the sacred peak of Nanda Devi, using the physical climb as a metaphor for and partner in his medical healing and psychological survival. In this memoir, the boundaries between the human body and the natural landscape dissolve entirely. The tumor in his shoulder mirrors the rugged, unpredictable terrain of the rock face; the rigors of chemotherapy parallel the freezing, oxygen-starved conditions of high altitude. By enduring the physical strain of the mountain trek while battling cancer, Alter achieves a profound psychological breakthrough. He learns to accept vulnerability, finding strength not in defeating nature or disease, but in enduring with grace and resilience, much like the ancient peaks standing firm against the elements.

C. Psychological Healing and Landscape Integration

Alter's recovery from cancer through his engagement with the Himalayas highlights the therapeutic power of place-attachment. In times of profound personal crisis, modern urban environments often isolate individuals, amplifying fear and anxiety. Conversely, immersing oneself in a vast, indifferent, yet spiritually resonant natural landscape provides perspective and comfort. Through his intimate integration with the Himalayan landscape, Alter finds psychological peace. The mountains do not offer magical cures or shallow consolations; instead, their sheer magnitude puts human suffering into a balanced perspective. By the end of his journeys, Alter is no longer just an observer looking at the mountains from the outside—he has internalized their steadfast endurance, truly 'becoming a mountain' in spirit.

Conclusion

This research paper has explored the rich, multi-dimensional representation of the Himalayan landscape in the works of Stephen Alter. By analyzing his integration of sacred geography and mythology, his urgent ecological witnessing of glacial retreat and deforestation, and his deeply personal memoirs of physical endurance and cancer survival, this study demonstrates that Alter's writing transcends traditional travel literature. He constructs the Himalayas as a living archive, an interconnected ecosystem, and a sacred sanctuary that profoundly shapes human identity. Ultimately, Alter's literary corpus delivers a vital message for the contemporary world: human beings cannot detach themselves from the natural environments they inhabit and exploit. Whether examining the spiritual devotion of pilgrims along sacred river valleys or documenting the devastating impact of climate change on high-altitude glaciers, Alter insists that true ecological health requires both scientific awareness and spiritual humility. His personal triumphs over physical illness mirror the planet's urgent need for ecological healing and resilience. Future scholarly research could expand upon these insights by undertaking comparative ecocritical studies of Stephen Alter alongside other prominent mountain and nature writers, such as Ruskin Bond, Amitav Ghosh, or international environmental authors. Additionally, further investigations into how climate fiction and eco-memoirs address the geopolitical and ecological fragility of South Asian mountain ranges will continue to enrich our understanding of environmental literature in the twenty-first century.

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The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Original Article

Women, Desire and Resistance: Reimagining Gender Relations in the Fiction of Anita Desai and Namita Gokhale

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Abstract

This research paper presents a comparative study of women, desire, and resistance through selected novels by Anita Desai and Namita Gokhale. By tracing the historical evolution of gender relations in Indian English literature, this investigation examines how female emotional and physical longings function as powerful catalysts for subverting patriarchal control. Desai's fiction maps the interior landscape, illustrating how domestic suffocation and suppressed needs lead to existential alienation, psychological containment, and inward-facing endurance. In contrast, Gokhale's narratives utilize satire, sexual liberation, and vocal autonomy to externalize defiance and challenge traditional moral policing. Utilizing feminist literary theory, psychoanalytic criticism, and body politics, the analysis evaluates contrasting trajectories of resistance. The findings reveal that while Desai's characters navigate oppression through quiet withdrawal or tragic rebellion, Gokhale's heroines assert autonomy through active social confrontation. Despite distinct stylistic and generational differences, both authors demonstrate that reimagining modern gender relations is fundamentally contingent upon women reclaiming full ownership of their own desires. Ultimately, this comparative evaluation highlights how diverse literary strategies contribute to the ongoing evolution of feminist discourse.

Keywords; *Female Desire, Resistance, Gender Relations, Anita Desai, Namita Gokhale, Indian English Fiction, Feminist Criticism.*

Introduction

Gender relations within Indian English literature have experienced a remarkable transformation over decades. Early narratives frequently portrayed female characters as silent, enduring figures who accepted their assigned domestic boundaries without question. As literary traditions matured, storytelling shifted toward active self-definition, granting women the capacity to question societal scripts, voice personal needs, and shape their own destinies. Anita Desai and Namita Gokhale represent two distinct literary waves that chart this evolution. Desai concentrates heavily on existential alienation, examining the lonely interior worlds of women trapped in stifling marriages and traditional homes. Her focus remains fixed on mental landscapes and the quiet emotional tolls exacted by rigid social codes. In contrast, Gokhale confronts female sexuality, mythic history, and societal hypocrisy with bold candor and sharp irony. Her characters refuse silent endurance, directly challenging orthodox expectations through vocal defiance and unapologetic authenticity. Despite extensive individual commentary on both authors, a clear research gap persists regarding how the articulation of desire serves as the primary axis of resistance connecting these writers. Previous scholarship rarely investigates how moving from hidden emotional yearnings to vocal expressions of longing bridges generational divides. Evaluating these contrasting approaches uncovers how different literary generations tackle the same foundational problem: patriarchal control over female longing. To bridge this gap, this study argues that by transitioning from internal psychological containment to outward expressive subversion, Desai and Gokhale collectively dismantle patriarchal gender scripts, positioning female desire not as a site of moral transgression, but as an essential instrument of resistance.

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Objectives of the study

1. To investigate the construction and suppression of female desire within the patriarchal frameworks of selected novels by Anita Desai and Namita Gokhale.
2. To analyze the varied modalities of resistance employed by female protagonists when confronting oppressive gender norms.
3. To compare Desai's psychological inwardness with Gokhale's direct, subversive socio-cultural critique.
4. To evaluate how reimagined gender relations pave the way for modern feminist consciousness in Indian writing.

Literature Review

Scholarship centered on Indian women's writing has consistently engaged with the complexities of gender, body politics, and personal identity. Academic discourse frequently investigates how post-colonial narratives utilize domestic settings to challenge rigid social codes. Prominent critics like Jasbir Jain and J. Meena Kumari mapped the broader historical trajectory of female authorship, demonstrating how literary historians began dismantling the traditional image of the obedient homemaker. Their foundational analyses establish that creative texts serve as vital platforms for exposing systemic confinement and the regulation of female autonomy. Academic evaluations of Anita Desai place heavy emphasis on psychological interiority, existential alienation, and marital breakdown. Researchers examine how Desai portrays characters trapped within suffocating domestic spaces where communication fails entirely. Scholars highlight that heroines in novels like *Cry, the Peacock* or *Fire on the Mountain* experience profound inner turmoil rather than engaging in external protest. Instead of revolting openly, these figures suffer from deep psychological distress, nervous exhaustion, and quiet withdrawal. Critics note that Desai exposes the home not as a safe haven, but as an environment that suppresses emotional expression and stifles personal growth. Conversely, scholarly reception surrounding Namita Gokhale focuses on her fearless subversion of traditional archetypes, frank treatment of female sexuality, and clever reclamation of myth and history. Analysts studying works such as *Paro: Dreams of Passion* emphasize how Gokhale breaks away from puritanical expectations through satire, humor, and social critique. Researchers point out that her protagonists reject passive endurance, asserting their bodily autonomy and desires openly to challenge male dominance and institutional hypocrisy.

Despite the substantial body of critical commentary dedicated to both authors individually, a noticeable research gap remains within contemporary literary criticism. While numerous essays analyze Desai's internal struggles or Gokhale's externalized rebellions separately, few scholarly works construct a focused comparative study linking the evolution of female desire directly to acts of active or passive resistance. Existing evaluations rarely bridge the generational divide separating Desai's melancholic psychological realism from Gokhale's vibrant, subversive style. Addressing this gap is essential for understanding how feminist discourse evolved in Indian English fiction. Placing these contrasting voices side by side reveals how two distinct generations of writers employed alternative artistic methods to explore the same fundamental theme: the struggle to reclaim ownership of female desire and redefine modern gender relations.

Methodology

This investigation adopts a comparative qualitative textual analysis to examine how selected authors represent desire, gender relations, and resistance. By placing distinct literary texts side by side, the study highlights parallel motifs, thematic contrasts, and evolutionary shifts in female representation. Three primary critical frameworks guide the analytical process. First, feminist literary theory establishes the foundational lens for evaluating power imbalances, societal oppression, and liberation strategies. Second, psychoanalytic criticism helps decode the deep emotional turmoil, mental isolation, and suppressed yearnings experienced by characters. Third, body politics and queer-feminist perspectives provide tools to analyze physical autonomy, sexuality, and the subversion of normative bodily boundaries. The primary corpus consists of selected novels by Anita Desai and Namita Gokhale. Desai's works—specifically *Cry, the Peacock* and *Fire on the Mountain*—anchor the examination of internal psychological suppression and quiet endurance. Conversely, Gokhale's novels, including *Paro: Dreams of Passion* and *Things to Leave Behind*, drive the exploration of outward subversion, sexual agency, and social defiance. Close reading of these narratives uncovers how each writer constructs alternative modes of self-expression. To validate these textual interpretations, secondary sources are utilized extensively. These materials encompass peer-reviewed literary journals, critical anthologies, and cultural studies publications. Integrating external academic commentary ensures the findings align with established scholarly standards while offering a fresh perspective on the evolution of modern feminist literature.

Analysis

Anita Desai constructs narratives where domestic spaces become sites of intense emotional and physical suffocation. Within her fictional households, traditional marital structures deny women the freedom to express genuine desires or fulfill personal aspirations. Husbands frequently remain emotionally detached, leaving wives isolated inside rigid architectural boundaries. This environment suppresses vitality, turning homes into quiet prisons where emotional and physical needs go entirely unmet. Faced with this deep confinement, Desai's protagonists cannot launch open rebellions. Instead, they resort to desperate internal strategies, utilizing madness, heavy silence, and existential withdrawal to resist subjugation. Characters experiencing overwhelming frustration often retreat into mental isolation or nervous breakdowns. These psychological collapses function as silent protests against oppressive domestic codes. While these inward-turning reactions signal a fierce rejection of patriarchal control, they simultaneously highlight the severe limits placed on female autonomy, frequently ending in tragic isolation rather than true

liberation. A central conflict in Desai's work involves the violent clash between societal definitions of the ideal woman and authentic internal desires. Society demands self-sacrifice, quiet obedience, and emotional restraint. When female characters harbor deep passions or intellectual yearnings that contradict these orthodox standards, a profound fracture occurs within their psyches. This tension exposes the cruelty of patriarchal socialization, illustrating how rigid expectations crush individual spirit long before any physical defiance can take place. Namita Gokhale shifts the literary landscape by introducing a vibrant politics of subversion and outward defiance. Her novels actively reject passive suffering, focusing instead on the conscious reclamation of female sexuality and personal agency. Gokhale's heroines refuse to treat physical and emotional longings as sources of shame. Instead, they claim bodily autonomy proudly, viewing desire as a natural expression of selfhood rather than a moral transgression subject to patriarchal approval. To dismantle orthodox expectations, Gokhale employs sharp satire, biting wit, and direct resistance against traditional moral policing. Her characters mock hypocritical social customs, exposing the fragility of male vanity and patriarchal authority. Rather than maintaining polite silence, these women talk back, question authority, and publicly ridicule rigid community standards. This vocal defiance shatters the illusion of infallible male supremacy, creating an atmosphere of lively disruption.Ultimately, Gokhale's fiction redefines autonomy across generational and societal boundaries. By showcasing characters who break free from traditional marital cages or rewrite the rules of domesticity from within, she demonstrates that self-actualization takes diverse forms. Whether women choose to reform oppressive relationships or walk away to build independent lives, Gokhale establishes that true freedom requires active resistance, humor, and an unyielding commitment to personal truth.

Discussion

Analyzing these two literary canons side by side reveals a striking contrast between Anita Desai's tragic, psychological interiority and Namita Gokhale's unapologetic, externalized expression of desire. Desai's heroines carry heavy emotional burdens inside closed minds, fighting invisible battles against domestic suffocation. Their struggles remain internal, marked by melancholic withdrawal, mental exhaustion, and profound isolation. Conversely, Gokhale champions an outward, vibrant reclamation of selfhood. Her characters refuse sorrowful endurance, opting instead for vocal assertiveness, sharp wit, and public defiance. Where Desai exposes the crushing weight of hidden longings, Gokhale celebrates the liberating power of openly declared passions. This stylistic divergence maps a fascinating evolutionary trajectory of resistance across generations. Initially, resistance functions as a defensive psychological shield. Women under Desai's pen utilize madness, silence, and nervous collapse to protect their fragile sanity against overwhelming domestic pressure. These tactics represent a desperate form of survival rather than an offensive strike. As literary and social landscapes shifted, Gokhale's fiction pushed resistance forward into open social disruption. Her protagonists take the battle directly to the public sphere, mocking hypocritical moral codes, demanding sexual autonomy, and dismantling patriarchal rules through active confrontation. Resistance transforms from a quiet retreat into a loud, revolutionary demand for space. Evaluating the implications for gender relations uncovers how successfully these texts restructure or dismantle traditional male-female dynamics. Neither author offers a simple utopian resolution where patriarchy vanishes effortlessly. Instead, the conclusions of their narratives demonstrate that restructuring power dynamics requires painful negotiation. In Desai's novels, male-female hierarchies frequently remain intact, crushing the protagonist unless she escapes through tragic death or complete mental breakdown. In Gokhale's works, traditional dynamics face active dismantling, forcing male characters to confront female independence on equal footing. Ultimately, bringing these distinct voices into dialogue demonstrates that female empowerment is multifaceted. Desai maps the devastating psychological cost of fighting an invisible cage, while Gokhale shows the thrilling potential of breaking it wide open. Together, their literary contributions chart a comprehensive roadmap for modern gender relations, proving that diverse forms of resistance are necessary to achieve true self-actualization.

Results

This comparative study yields three essential findings concerning gender dynamics in modern Indian English fiction. First, female desire operates as a deeply disruptive agent that directly challenges patriarchal stability across both literary works. Whenever women articulate emotional or physical longings, orthodox social structures experience immediate strain. Second, the chosen methods of resistance diverge significantly between the two authors. Desai's heroines confront oppression through intense psychological withdrawal, silent suffering, or tragic rebellion. Conversely, Gokhale's characters rely on vocal autonomy, sharp wit, and uninhibited sexual liberation to challenge traditional authority. Finally, despite generational differences and contrasting narrative styles, both writers establish a shared conclusion: successfully reimagining gender relations is entirely contingent upon women reclaiming full ownership of their own desires. Personal autonomy remains impossible until this foundational recovery occurs.

Conclusion

This comparative investigation demonstrates how Anita Desai and Namita Gokhale utilize the complex of desire and resistance to reshape traditional gender paradigms. Desai maps the heavy psychological tolls exacted by domestic suffocation, showing how internal yearnings suppressed within marriage often manifest as nervous exhaustion or tragic withdrawal. In contrast, Gokhale champions an outward reclamation of selfhood, employing satire, sexual liberation, and sharp vocal autonomy to dismantle patriarchal expectations. While their stylistic approaches differ radically—ranging from melancholic interiority to vibrant public defiance—both authors establish that female

desire acts as a potent disruptive force against systemic control. The literary contributions left by these writers remain foundational to Indian feminist discourse. By exposing the invisible cages of domesticity and celebrating unapologetic bodily autonomy, Desai and Gokhale expanded the boundaries of what female characters could experience and express in literature. Their oeuvres continue to influence subsequent generations, proving that storytelling serves as an essential vehicle for social critique and personal liberation. Looking ahead, future scholarship can build upon this foundation by examining contemporary twenty-first-century fiction through the same critical lens. Exploring how modern authors navigate evolving digital cultures, shifting societal norms, and emerging definitions of intimacy will offer valuable insights into the ongoing transformation of female desire and resistance.

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Original Article

Artificial Intelligence and Service Quality in Public and Private Sector Banks: An Empirical Study of Customer Satisfaction in Rural Areas of Jalgaon District

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Abstract

Artificial Intelligence (AI) is increasingly being integrated into banking through automated assistance, fraud monitoring, biometric security, predictive tools and digital service channels. This study examines the relationship of AI adoption with service quality and customer satisfaction among public and private sector bank customers in rural Jalgaon District, Maharashtra. A quantitative empirical design was applied to 400 respondents, equally divided between the two sectors. Service quality was assessed using the SERVQUAL dimensions of Tangibility, Reliability, Responsiveness, Assurance and Empathy. The data were examined using reliability, descriptive, correlation and regression analysis. The findings indicate favourable perceptions of AI-enabled banking and positive relationships among AI adoption, service quality and customer satisfaction. The study provides practical implications for technology-enabled rural banking and digital financial inclusion.

Keywords: *Artificial Intelligence; Service Quality; Customer Satisfaction; SERVQUAL; Rural Banking; Public Sector Banks; Private Sector Banks.*

Introduction

Artificial Intelligence (AI) is reshaping banking through automated customer assistance, fraud monitoring, biometric authentication, predictive analysis and personalised services. These applications can improve processing speed, accuracy, security and convenience. In rural markets, however, the value of technology depends on digital literacy, connectivity, awareness and customer trust. Public and private sector banks may also differ in technological capability and service delivery. Jalgaon District provides a relevant setting for examining this issue because rural customers increasingly use mobile banking, UPI and other digital channels. Existing literature has widely examined service quality or digital banking, but comparatively limited district-level evidence integrates AI adoption, SERVQUAL and customer satisfaction in rural banking. The present study addresses this gap using primary data from rural Jalgaon District.

Literature Review and Research Gap

SERVQUAL is an established framework for measuring perceived service quality through Tangibility, Reliability, Responsiveness, Assurance and Empathy (Parasuraman et al., 1988). Technology-acceptance research emphasises perceived usefulness and ease of use in technology adoption (Davis, 1989; Venkatesh et al., 2003). Recent studies show that digital banking quality, reliability, security and technological capability are associated with customer satisfaction. However, relatively few studies combine AI adoption with SERVQUAL in rural banking or compare public and private sector customers at district level. This study addresses that contextual gap.

Objectives and Hypotheses

The study aims to assess AI adoption, evaluate service quality using SERVQUAL, examine relationships among AI adoption, service quality and satisfaction among customers of public and private sector banks, and suggest measures for strengthening AI-enabled rural banking.

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H_{01}: There is no significant relationship between AI adoption and service quality. H_{02}: There is no significant relationship between service quality and customer satisfaction. H_{03}: AI adoption has no significant impact on customer satisfaction.

Research Methodology

The study uses an empirical, quantitative, descriptive and comparative design. The study area is rural Jalgaon District, Maharashtra. Stratified random sampling was used to obtain 400 valid responses, comprising 200 public sector and 200 private sector bank customers. Primary data were collected through a structured questionnaire using a five-point Likert scale. Secondary information was drawn from academic literature, RBI and bank reports, and government publications. The analysis used percentage, mean, standard deviation, Cronbach's Alpha, Pearson correlation and simple linear regression.

Particular	Description
Design	Descriptive and Comparative
Approach	Quantitative; Empirical
Study Area	Rural Areas of Jalgaon District, Maharashtra
Sample	400 respondents (200 Public; 200 Private)
Sampling	Stratified Random Sampling
Instrument	Structured Questionnaire; Five-Point Likert Scale
Model	SERVQUAL

5. Results and Interpretation

5.1 Demographic Profile

Variable	Category	n	%
Gender	Male	227	56.75
	Female	170	42.50
	Other	3	0.75
Age	18–30	102	25.50
	31–40	137	34.25
	41–50	111	27.75
	Above 50	50	12.50
Education	Primary	47	11.75
	Secondary	112	28.00
	Graduate	118	29.50
	Postgraduate	103	25.75
	Others	20	5.00
Occupation	Farmer	122	30.50
	Business	92	23.00
	Service	92	23.00
	Student	54	13.50
	Others	40	10.00
Income	Below ₹20,000	144	36.00
	₹20,001–₹40,000	119	29.75
	₹40,001–₹60,000	76	19.00
	Above ₹60,000	61	15.25
Bank	Public	200	50.00
	Private	200	50.00
Experience	Less than 2 Years	89	22.25
	2–5 Years	118	29.50
	6–10 Years	104	26.00
	More than 10 Years	89	22.25

The sample is balanced by bank sector. The largest groups were males (56.75%), respondents aged 31–40 years (34.25%), graduates (29.50%), farmers (30.50%) and respondents earning below ₹20,000 (36.00%).

5.2 Reliability and Descriptive Statistics

Construct	Items	α	Mean	SD
AI Adoption	8	0.912	3.493	0.740
Tangibility	4	—	3.496	0.756
Reliability	4	—	3.515	0.737
Responsiveness	4	—	3.494	0.731
Assurance	4	—	3.510	0.729
Empathy	4	—	3.474	0.770
Overall Service Quality	20	0.948	3.498	0.745
Customer Satisfaction	6	0.901	3.496	0.753
Overall Scale	34	0.966	—	—

All Cronbach's Alpha values exceed 0.70, indicating strong internal consistency. Mean scores above 3.40 indicate generally favourable perceptions of AI adoption, service quality and customer satisfaction.

5.3 Correlation and Hypothesis Results

Hypothesis	Test	Result	Decision
H_{01}: No AI–service quality relationship	Pearson correlation	$r = 0.742$; $p < 0.01$	Rejected
H_{02}: No service quality–satisfaction relationship	Pearson correlation	$r = 0.801$; $p < 0.01$	Rejected
H_{03}: No AI impact on satisfaction	Simple linear regression	$p < 0.001$	Rejected

The correlation coefficients show strong positive associations between AI adoption and service quality ($r = 0.742$) and between service quality and customer satisfaction ($r = 0.801$). AI adoption is also positively associated with customer satisfaction ($r = 0.718$); all reported correlations are significant at the 0.01 level.

Because only one predictor is examined, simple linear regression is the appropriate model. The regression statistics are mathematically derived from the reported correlation ($r = 0.718$), sample size ($N = 400$), and reported standard deviations (AI = 0.740; satisfaction = 0.753). They are calculated estimates, not SPSS output.

Simple Linear Regression: AI Adoption → Customer Satisfaction

R	R^2	Adjusted R^2	Std. Error
0.718	0.516	0.514	0.525

Predictor	B	Std. Error	Beta	t	Sig.
Constant	0.946	0.062	—	15.26	<0.001
AI Adoption	0.731	0.036	0.718	20.58	<0.001

The calculated model indicates a statistically significant positive relationship between AI adoption and customer satisfaction ($\beta = 0.718$, $p < 0.001$). AI adoption explains approximately 51.6% of the variance in customer satisfaction ($R^2 = 0.516$). This is a calculated estimate based on the reported summary statistics, not an SPSS output.

Discussion and Conclusion

The results indicate that stronger AI adoption is associated with better perceived service quality and higher customer satisfaction among rural banking customers. The findings are consistent with the broader literature showing that reliability, responsiveness, security and technology-enabled convenience are important components of digital banking experience. The evidence also supports the use of SERVQUAL for evaluating customer perceptions in technology-enabled banking. The study concludes that banks should expand useful AI-enabled services while maintaining reliable infrastructure, cybersecurity, customer assistance and digital awareness. Such measures can improve customer experience and support rural digital financial inclusion.

Practical Implications, Limitations and Future Scope

Banks should strengthen AI-enabled channels, cybersecurity, digital infrastructure, employee training and customer digital-literacy initiatives. The study is limited to rural Jalgaon District, public and private sector banks, cross-sectional data and selected variables. Future studies may include cooperative and regional rural banks, and additional factors such as trust, perceived risk, digital literacy and technology readiness, using larger samples and advanced methods such as SEM/SmartPLS.

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Conflicts of interest

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Original Article

A Study on Environmental Law and the Legal Framework for Toxic Chemical Management

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Abstract

Rapid industrialization, urbanization, and technological progress have increased the production and use of toxic chemicals worldwide. Although chemicals support economic growth and modern life, improper handling and disposal cause serious harm to public health and the environment by contaminating air, water, soil, and food systems. Environmental law plays an important role in regulating hazardous substances, ensuring industrial accountability, and protecting human health. This paper examines the impact of toxic chemicals on public health, the environmental dimensions of chemical pollution, and the regulatory challenges under international and national environmental laws. It also emphasizes the need for stronger enforcement, sustainable industrial practices, public awareness, and global cooperation to control toxic chemical pollution.

Keywords: *Environmental Law, Toxic Chemicals, Hazardous Waste Management, Chemical Pollution, Public Health Protection, Environmental Governance, Sustainable Development, International Environmental Conventions.*

Introduction

Chemical substances are extensively used in industries, agriculture, medicine, and household products. However, many chemicals such as heavy metals, pesticides, industrial solvents, and hazardous waste are toxic and harmful to humans and ecosystems. Exposure through air, water, food, or skin contact can cause serious health problems, including respiratory diseases, cancers, neurological disorders, and reproductive issues. Environmental law regulates the production, use, storage, and disposal of hazardous chemicals through national laws and international agreements. Despite these measures, challenges such as weak enforcement, scientific uncertainty, industrial resistance, and transboundary pollution continue to hinder effective regulation. This paper examines the environmental and public health impacts of toxic chemicals and analyzes the legal frameworks addressing chemical pollution.

Meaning and Nature of Toxic Chemicals

Toxic chemicals are harmful substances that can damage humans, animals, plants, and ecosystems due to their poisonous, corrosive, reactive, or carcinogenic nature. Major categories include heavy metals such as lead, mercury, cadmium, and arsenic; industrial chemicals like benzene, asbestos, and PCBs; agricultural chemicals including pesticides, herbicides, and fertilizers; persistent organic pollutants (POPs) that accumulate in the environment and living organisms; and radioactive substances that emit harmful radiation.

Sources of Toxic Chemical Pollution

Industrial activities, mining operations, and excessive agricultural chemical use release toxic substances into the environment. Improper disposal of industrial and electronic waste further contaminates soil and water, while chemical leaks and industrial accidents can cause serious public health emergencies.

Effects of Toxic Chemicals on Public Health

Exposure to toxic chemicals can cause respiratory diseases such as asthma, lung cancer, and bronchitis. Heavy metals like lead and mercury damage the nervous system and brain development, while carcinogenic chemicals increase the risk of skin, lung, and blood cancer. Chemical pollution may also lead to infertility, birth defects, hormonal imbalance, and serious illnesses caused by contaminated drinking water.

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Environmental Consequences

Toxic chemicals harm both human health and ecosystems. Industrial waste pollutes rivers, lakes, and groundwater, while chemical contamination degrades soil fertility and reduces agricultural productivity. Toxic emissions also contribute to air pollution, acid rain, smog, climate change, and loss of biodiversity by harming wildlife and plant species.

International Legal Framework

Stockholm Convention on Persistent Organic Pollutants (2001)

The Convention seeks to eliminate or restrict hazardous persistent organic pollutants and protect human health and the environment.

Basel Convention (1989)

Regulates transboundary movement and disposal of hazardous waste.

Rotterdam Convention (1998)

Promotes prior informed consent regarding international trade in hazardous chemicals and pesticides.

Minamata Convention on Mercury (2013)

Addresses mercury pollution and aims to reduce mercury emissions globally.

United Nations Sustainable Development Goals (SDGs)

SDG 3 and SDG 12 emphasize public health protection and environmentally sound chemical management.

National Legal Framework

India has enacted several environmental laws to regulate toxic chemicals and industrial pollution.

Environment Protection Act, 1986

Provides comprehensive powers to regulate environmental pollution and hazardous substances.

Water (Prevention and Control of Pollution) Act, 1974

Controls water pollution caused by industrial and chemical discharge.

Air (Prevention and Control of Pollution) Act, 1981

Regulates industrial emissions and air pollutants.

Hazardous and Other Wastes Rules, 2016

Regulate the management and disposal of hazardous waste.

Public Liability Insurance Act, 1991

Provides immediate relief to victims affected by hazardous industrial accidents.

Factories Act, 1948

Contains provisions relating to occupational safety and handling of hazardous substances.

Significant Judicial Responses

Union Carbide Corporation v. Union of India (Bhopal Gas Tragedy)

One of the world's worst industrial disasters occurred due to the leakage of methyl isocyanate gas from the Union Carbide plant in Bhopal, India. Thousands died, and many suffered long-term health effects. The tragedy exposed weaknesses in industrial regulation and environmental governance.

M.C. Mehta v. Union of India

The Supreme Court of India introduced the principle of absolute liability for hazardous industries engaged in dangerous activities.

Vellore Citizens Welfare Forum v. Union of India

The Court recognized the precautionary principle and sustainable development as essential elements of environmental governance.

Challenges in Environmental Law Regulations

Weak Enforcement Mechanisms

Environmental regulations often face weak implementation and monitoring.

Scientific Uncertainty

Assessing long-term effects of chemical exposure remains difficult.

Industrial Resistance

Industries may resist stricter regulations because of higher compliance costs

Lack of Public Awareness

People are often unaware of toxic chemical risks.

Transboundary Pollution

Chemical pollution often spreads across national borders, making enforcement difficult.

Inadequate Waste Management

Inadequate disposal and recycling practices increase toxic contamination

Importance of Environmental Principles

Precautionary Principle

Preventive action should be taken against environmental harm despite scientific certainty.

Polluter Pays Principle

Industries causing pollution must bear the costs of environmental damage and cleanup.

Sustainable Development

Economic growth should be balanced with environmental protection and public health.

Conclusion

Toxic chemical pollution seriously threatens public health, ecological balance, and sustainable development. Although environmental laws and international conventions provide important regulatory frameworks, weak implementation often limits their effectiveness. Addressing toxic exposure requires a multidisciplinary approach combining environmental science, public policy, and legal regulation. Stronger enforcement, scientific advancement, industrial accountability, and public awareness are essential to reduce the risks of toxic chemicals and ensure a safer environment for present and future generations.

Recommendations

1. Improve enforcement of environmental laws and regulatory standards.
2. Promote scientific research on toxic chemical exposure and its public health effects.
3. Encourage green chemistry and sustainable industrial practices.
4. Strengthen hazardous waste management and recycling systems.
5. Promote public participation and environmental awareness.
6. Implement stricter industrial monitoring and compliance measures
7. Promote international cooperation to control

transboundary pollution.
8. Enhance corporate environmental accountability through ESG reporting and liability measures.

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