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Gyan Management is published in January and July every year. The journal accepts theoretical and applied research work for publication. It publishes original, research-based papers, articles, cases & book reviews on topics of current concern in all areas of management & technology affecting the business environment.

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Aims and Scope

Gyan Management is an open-access International Bi-annual refereed journal published by the Gian Jyoti Institute of Management and Technology since 2007. The journal aims to advance knowledge and practice in the fields of Management & Commerce, Business Strategies, and Information Technology through the dissemination of high-quality research. It is a highly reputable and acclaimed journal that includes theoretical and applied research contributing to the understanding and development of management practices and technological innovations.

Gyan Management serves as a vital communication channel between academia and industry, facilitating dialogue between decision-makers, policy influencers, and scholars. The journal publishes original research papers, case studies, articles, and book reviews addressing contemporary issues and emerging trends within these disciplines. By focusing on applied research and practical insights, it supports the implementation of effective systems and strategies in the business world, promoting informed decision-making and enhancing educational outcomes in the management and technology sectors.

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Exploring the Role of Artificial Intelligence in Sustainable Development: A Bibliometric Analysis

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Abstract

With the growing importance of sustainability, particularly associated with sustainable development goals (SDGs) that pursue growth in economy as well as environmental sustainability. Researchers have increasingly focused on SDGs due to their profound social impact and the urgent need to promote sustainability across sectors. In this premise, one of the new technologies, that is, Artificial Intelligence (AI), lies in its potential to offer an exclusive opportunity to address critical challenges related to sustainability. However, there is a paucity of systematic researches that explore AI's role in attaining sustainability. Therefore, this study offers a comprehensive overview and unified perspective through the Bibliometric approach by examining 1,342 studies. The study also highlights a significant shift towards holistic approaches, with a marked increase in publications and empirical studies since 2019, indicating the field's rapid growth and maturity. Additionally, the findings highlight key journals, publications and contributors to this study and point to AI's role in achieving sustainability in a variety of fields. It recognizes three crucial areas which will help both academics and practitioners in assessing their present trend of AI and sustainability practices, identifying potential research priorities and making informed decisions about AI investments for sustainable growth.

Keywords

Artificial intelligence, sustainability, sustainable development, bibliometric analysis

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Introduction

Sustainable development emerged as a concept in the 1970s, has gained significant attention in recent years. Initially, it was meant as a "form of resistance, merging deep environmental awareness with a critical reassessment of a failing development enterprise." This perspective emphasized issues such as resource scarcity, environmental limits, wealth disparity, worldwide disparity, and the ecological effects of modernization (Carruthers, 2001). In essence, it highlights the significance of rethinking traditional development models to address problems in the society, environment, and economy.

To achieve sustainability and tackle the obstacles associated with each part, that is, environmental, social, and economic, businesses increasingly adopt innovative models integrated with advanced technology (Boons & Lüdeke-Freund, 2013). The incorporation of technology into business operations offers several benefits, including value creation, cost efficiency, efficient management, waste reduction, etc. (Hariyani et al., 2024). Artificial intelligence (AI) stands out as a transformational and fast-evolving instrument in the area of advanced technologies. AI offers machines the capability to learn, adapt to changes, and perform activities similar to those performed by humans (Duan et al., 2019). It encompasses evolving intelligent systems that are capable of advanced cognitive functions like thinking, learning, perceiving, addressing issues, and making judgements.

In line with the thought of sustainability, businesses have started exploring with latest technologies like AI to redefine their business models. It is being applied in many industries, such as healthcare, finance, transportation, tourism, supply chain, and education, to enhance capital efficiency and promote sustainable practices (Tabbakh et al., 2024). Notably, the potential contribution from AI to the global economy is projected to surpass an estimated $15.7 trillion before 2030, underscoring its transformative impact (PwC Analysis, n.d.).

Furthermore, AI offers three main benefits. First, it automates necessary but repetitive and lengthy tasks, enabling individuals to concentrate on higher-value activities. Additionally, it uncovers valuable findings hidden within vast volumes of unstructured data, such as data created via videos, images, written reports, company records, online posts, and e-mail exchanges. Third, AI integrates numerous computational resources to answer the most challenging issues. In resultant, by utilizing the power of AI, businesses can make production and distribution processes more sustainable, reduce the waste of resources, and deliver more personalized and environmentally friendly services.

Global collaborations between researchers and businesses are exploring AI's role in improving sustainability. These partnerships emphasize R&D investments aimed at leveraging AI to achieve sustainable outcomes (Raman et al., 2024). Such initiatives demonstrate the growing role of AI's potential to transform different industries and address critical challenges. However, despite these attempts, previous research studies on the role of AI in sustainability remain insufficient to fully capture its potential. While existing research highlights the promising applications of AI. There is still a considerable gap in understanding the complete scope of AI's integration with sustainability initiatives. This includes exploring

how AI can help businesses foster sustainable development by boosting resource efficiency, minimizing waste, and supporting environmentally friendly practices.

To address the gap in understanding both concepts, that is, AI and sustainability, the present study offers a comprehensive and structured exploration of their synergies through bibliometric analysis. This approach facilitates significant areas where further investigation can reveal new dimensions and opportunities. Consequently, this article provides a detailed overview of existing work on AI and sustainability, establishing a foundation for further exploration, paving the way for enhancements in this vital field. The study is structured in this order: the second section outlines an overview of AI and sustainability, while the third section details the methodology employed in this article. The fourth section outlines the study's key insights, and the fifth section offers a concise conclusion. The final section discusses the limitations and suggested areas for potential research.

Review of Literature on AI and Sustainability

The digitization and AI have significantly reshaped global industries, transforming lives through enhanced efficiency and precision across different sectors such as healthcare, insurance, hospitality, transportation, education, and entertainment (Bolón-Canedo et al., 2024; Rane et al., 2024). Additionally, AI is increasingly being used in sustainable development and playing a vital role in supporting key sustainable development goals (SDGs) like SDG 7 and SDG 13.

The review of literature in this premise indicated that researchers are working on various aspects of its complex dynamics. For instance, Ali et al. (2024) emphasized that AI enhances process optimization and sustainability performance; meanwhile, Min et al. (2024) highlighted the use of technology to promote sustainable fashion. Lukic Vujadinovic et al. (2024) highlighted that AI minimizes idle time, optimizes resource utilization, and supports sustainability goals. Similarly, Balcıoğlu et al. (2024) pointed out that businesses are leverage AI would lower the level of emissions, reduce energy consumption, and manage waste effectively. In academics, AI solutions like ChatGPT offer personalized learning, support sustainable education and highlight the need for AI literacy and ethical guidelines in curricula (Boustani et al., 2024; Espinoza Vidaurre et al., 2024). Moreover, integrating AI and IoT systems significantly enhances innovation and creativity (Gajić et al., 2024).

Furthermore, existing literature exhibits the growing importance of new technologies in fostering sustainability across various domains, such as a study by Su and Mokmin (2024) explored how the impact of AI on art & education can foster the sustainable aspect by optimized the use of resources and enhancing accessibility. Similarly, other researchers have examined the relationship between various technologies and sustainability, with a focus on the effective use of AI to ensure the availability of clean and sustainable water. Gajić et al. (2024) investigated the influence of AI on customer behavior and perceptions in the hospitality industry, especially in restaurants, airlines, and hotels. Khalid et al. (2024) highlighted how risk management by AI technology is closely linked to sustainable

decision-making. These diverse perspectives underscore the richness of the past literature, yet they also reveal a fragmented landscape. In order to fill this gap, this study seeks to synthesize the extensive body of research, offering a systematic framework along with a unified perspective with the help of bibliometric analysis. The methodology used for this study is provided in a subsequent section.

Research Methodology

To enhance the knowledge regarding the interaction between AI and sustainability, a bibliometric analysis was carried out. The bibliometric approach was selected for two reasons: its efficiency in processing a massive amount of bibliographic data and its capacity to objectively identify influential studies within the field (Donthu et al., 2021). The analysis utilized the process outlined by Donthu et al. (2021), utilizing a four-step technique:

1. Outlining the study's goal and scope.
2. Selecting appropriate methods for the analysis.
3. Identifying relevant keywords, databases, and data.
4. Conducting and presenting the findings.

The detailing of this methodology is discussed in the subsequent sections.

To organize the research, this study's objectives were divided into three key research queries.

RQ1: What are the latest trends in publication in the area of AI and sustainability (articles per year)?

RQ2: What are the most influential research publications in the area of AI and sustainability?

RQ3: Who made the most significant and productive contributions in terms of authors and countries to the area of AI and sustainability?

RQ4: What is the conceptual structure (keyword co-occurrence) of the field of AI and sustainability?

In an attempt to narrow the extent, an exhaustive review of literature indicated that most of the bibliometric articles typically analyze a period of 10 years for their analysis (Prahani et al., 2022; Tang et al., 2018). Therefore, the period was limited to 2014–2024, ensuring sufficient data coverage within this timeframe.

The next step is to determine the relevant keywords to extract bibliometric data. Based on a review of related literature from Google Scholar, the most repetitive keywords were "Artificial intelligence," "sustainable development," "*digital sustainability*," "sustainability," and "green practices." As a result, these keywords were chosen for retrieving pertinent literature.

Once the keywords were shortlisted, the next step involved selecting an appropriate database. A review of bibliometric research revealed that the Scopus database is particularly well-suited for social sciences studies due to its comprehensive coverage of academic content (Kumar et al., 2022; Tiwary et al., 2021). Therefore, the Scopus database provided the bibliometric data for this study. The search query applied was: "((TITLE-ABS-KEY(*'Artificial intelligence'*) OR

TITLE-ABS-KEY (*'AI'*)) AND ((TITLE-ABS-KEY(*'sustainability'*) OR TITLE-ABS-KEY(*'digital sustainability'*) OR TITLE-ABS-KEY (*'sustainable development'*) OR TITLE-ABS-KEY (*'green practices'*))).”

The first search found a total of 1,597 articles published between 2014 and 2024. To refine this dataset, multiple filters were applied using the Scopus database. Based on the existing bibliometric studies, the publications were filtered on the basis of some criteria in the Scopus database. These filters were limited to ensure the inclusion of rigorously peer-reviewed research. Additionally, misspelled, incomplete, and irrelevant entries were removed during the filtration process, and all the inclusive criteria are shown in Table 1. As a result, 1,342 articles were finalized for the study.

In the last step, the procedure involves executing the analysis and interpreting the results. For this study, the analysis was conducted using the biblioshiny application within the R software (v 4.4.2). The thorough details of the findings are given in the subsequent section.

Analysis

In the present study, Bibliometric analysis is conducted through four distinct dimensions: publication patterns, publication performance, contributor performance, and conceptual structure. The Biblioshiny application leverages specialized techniques for each dimension, such as analysis of performance to assess publication pattern, analysis of citation to measure both journal and author

Table 1. Inclusive Criteria for Research Articles.

Review Period 2014 To 2024		Number of Studies
Database	Scopus	
Keywords	“Artificial intelligence,” “Sustainable development,” “AI,” “green practices,” “sustainability,” and “digital sustainability”	
Filters applied	Source type: “Journal”	1,597
	Subject area: “Business, Management, and Accounting, Art and Humanities & Social Sciences”	
	Document type: “Articles”	
	Language: “English” Exact terms: “Artificial intelligence, Sustainability, Sustainable development, decision making, Innovation, Sustainable development goals, Industry 4.0”	
Omitted cells	Misspelled, incomplete and redundant elements	255
Final studies included		1,342

performance, and co-word occurrence analysis to uncover and map the conceptual structure. This study applied these techniques to explore and analyze the available literature on AI and sustainability. The findings are provided in the following sections, with emphasis on each of these four bibliometric analysis components.

Publication Pattern

A publishing performance technique was utilized to admire the progress of AI and sustainability publications in research articles between 2014 and 2024. The findings highlight a steady rise in AI adoption in sustainable practices research across various industries.

It can be observed that the advancement of AI and sustainability research tended to stagnate in 2014–2018 (Figure 1). In 2019, there was a significant rise in research on AI sustainability, which continued with more publications in 2020 and subsequent years. Academic interest in AI and sustainability is rising due to regulatory frameworks such as EU AI Act, UN-SDGs and AI's role in tackling climate challenges (Singh et al., 2024).

Publications' Performance

In the next stage of bibliometric analysis, the Biblioshiny application was employed to perform citation analysis, highlighting the performance of journals and articles. The analysis is divided into two categories: Journal performance and article performance.

Journal Performance

Table 2 highlights the count of AI and sustainability-related articles published across various Scopus-indexed journals. *Sustainability (Switzerland)* topped the list with 457 articles, followed by *Journal of Cleaner Production* with 90. Other

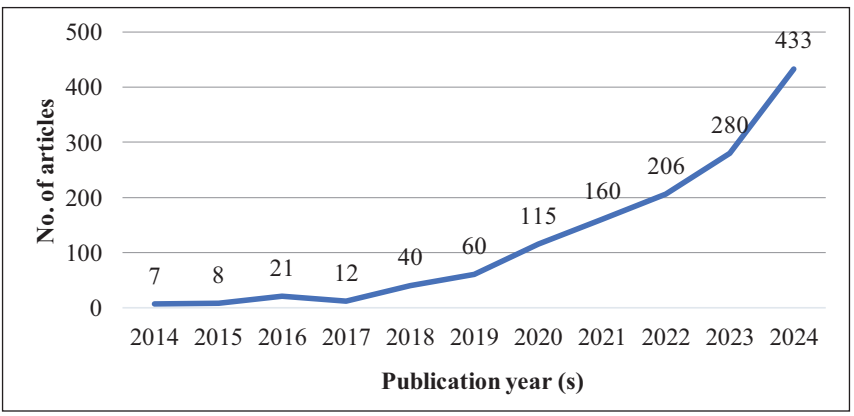

Figure 1. Publication Trend and Sustainability (2014–2024).

Table 2. Top 10 Marketing Journals.

Sources	Articles
Sustainability (Switzerland)	457
Journal of Cleaner Production	90
Sustainable Cities and Society	39
Technological Forecasting and Social Change	33
Resources Policy	21
Technology in Society	20
Water (Switzerland)	18
Business Strategy and the Environment	16
International Journal of Production Research	15
IEEE Transactions on Engineering Management	12

notable journals include *Sustainable Cities and Society* and *Technological Forecasting and Social Change*, which have 39 and 33 articles, respectively. This distribution reflects a diverse academic interest in AI and sustainability, encompassing fields such as sustainability, technology, and social change.

Articles Performance

Article performance was measured through citation analysis, focusing on two key types of citations: Local and global. Local citations capture how frequently articles within the review corpus (such as the 1,342 articles sourced from Scopus) cite one another. Global citations, on the other hand, show the overall number of instances an article is cited in the review corpus as well as by other sources (Kumar et al., 2021). Although the Biblioshiny failed to record any local citations, it revealed that one article (Table 3) received the highest global recognition, amassing 933 citations from both within and outside the 1,342 articles reviewed written by Kusiak (2018), applied the concepts of cyber-physical systems which are powered by technologies like the IOTs, cloud computing, service-oriented computing, AI, and data science. Allam and Dhunny (2019) examined the urban potential of AI and introduced a new framework that integrates AI technology with cities emphasizing the incorporation of key cultural dimensions with 709 citations. Di Vaio et al. (2020) study, "Artificial Intelligence and Business Models in the Sustainable Development Goals Perspective: A Systematic Literature Review" ranked third with 550 citations, emphasized the connections among AI, speedy technological advancements, and sustainable growth. "Artificial Intelligence for Sustainability: Challenges, Opportunities, and a Research Agenda" written by Elia et al. (2020) with 470 citations, explored human and social issues while offering a clear path for AI research and advancements. Bag et al. (2021) in their study with 465 citations, examined how auto companies leverage physical resources and labor capabilities to enable technology while promoting environmentally conscious production. Similarly, Ahad et al. (2020), with 384 citations explored and thoroughly examined the role of enabling technologies in smart cities.

Table 3. Top Influential Articles on AI and Sustainability.

Sr. No.	Article Title	Author(s)	Global Citation
1	"Smart Manufacturing"	Kusiak, 2018	933
2	"On Big Data, Artificial Intelligence and Smart Cities"	Allam and Dhunny, 2019	709
3	"Artificial Intelligence and Business Models in the Sustainable Development Goals Perspective: A Systematic Literature Review"	Di Vaio et al., 2020	550
4	"Digital Entrepreneurship Ecosystem: How Digital Technologies and Collective Intelligence Are Reshaping the Entrepreneurial Process"	Elia et al., 2020	534
5	"Artificial Intelligence for Sustainability: Challenges, Opportunities, and a Research Agenda"	Nishant et al., 2020	470
6	"Role of Institutional Pressures and Resources in the Adoption of Big Data Analytics Powered Artificial Intelligence, Sustainable Manufacturing Practices and Circular Economy Capabilities"	Bag et al., 2021	465
7	"Enabling Technologies and Sustainable Smart Cities"	Ahad et al., 2020	384
8	"Sustainable Supplier Management a Review of Models Supporting Sustainable Supplier Selection, Monitoring and Development"	Zimmer et al., 2016	351
9	"Integrated QFD-MCDM Framework for Green Supplier Selection"	Yazdani et al., 2017	338
10	"Artificial Intelligence and Sustainable Development"	Goralski and Tan, 2020	335

Zimmer et al. (2016), with 351 citations, analyzed scientific literature on sustainable supplier management (SSM) emphasizing formal models that support decision-making. Yazdani et al. (2017) focused on a comprehensive approach to green supplier selection, considering multiple environmental performance criteria and requirements. Goralski and Tan (2020) investigated how AI is changing business, government, and society with 335 citations.

Contributors' Performance

Following the analysis of publication trends and performance, the next phase of the bibliometric study shifts to evaluating the performance of contributors, including both authors and countries. In this study, contributor performance is measured

through two key factors: productivity, measured by the research articles produced by an author or nation and citations earned through their works. The findings of this investigation are explored in two separate sections: author performance and country performance.

Author Performance

Table 4 exhibits 10 of the most influential authors in the realm of AI and sustainability research. LIU Y leads with a total of 16 publications, marking them as the foremost contributor. The main theme of Liu Y's work focuses on combining digital technology and green solutions to tackle environmental challenges and promote sustainability. Chen Y, Wang J, and Wang X are close second with 10 publications each. Chen Y's research primarily explores the implementation of diverse AI technologies across various industries to achieve and sustain environmental and economic sustainability. The primary focus of studies by Wang J and Wang X has been to examine the key factors influencing AI adoption for sustainable development, addressing the perspectives of both consumers and policymakers. Other prominent authors in this field include Wang y (10 publications), Gupta S and Kumar A (9 publications each), Chatterjee S, Li J, and Zhang Y (8 publications each). These authors collectively drive the discourse on AI and sustainability through their extensive research efforts.

Country's Performance

Table 5 provides a country-wise analysis of total citations and average article citations. China stands out with 3,738 citations and an average of 17.20 citations per article, showcasing its leading role in this field. Italy follows with 3,112 citations and an average of 50.20 citations per article, indicating its growing influence. The United Kingdom also makes a significant contribution with 2,756 citations and an average of 46.70 citations per article. USA has 2,678 citations with an average citations per article 46.60, reflecting the high impact of its research. Australia, Germany, and Spain also play significant roles, with average citations per article

Table 4. Most Influential Authors.

Rank	Authors	Articles	Articles Fractionalized
1	Liu Y	16	4.56
2	Chen Y	10	2.39
3	Wang J	10	2.84
4	Wang X	10	2.43
5	Wang Y	10	3.45
6	Gupta S	9	2.32
7	Kumar A	9	1.92
8	Chatterjee S	8	2.03
9	Li J	8	2.43
10	Zhang Y	8	1.83

Table 5. Most Cited Countries in the Field.

Country	Total Citation	Average Article Citations
China	3,738	17.20
Italy	3,112	50.20
United Kingdom	2,758	46.70
USA	2,678	40.60
Australia	1,997	51.20
Germany	1,431	29.80
Spain	1,350	28.70
Korea	1,235	20.90
India	1,194	16.60
Canada	948	63.20

ranging from 51.20 to 28.70, indicating their active participation in AI and sustainability studies. Korea, India, and Canada, while having fewer total citations, still show strong average citations per article, underscoring the relevance of their research. This diverse international representation highlights the global importance of AI and sustainability research and the collaborative efforts to advance knowledge in these areas.

Conceptual Structure

The fourth stage of bibliometric analysis explored the conceptual structure of AI and sustainability research using 1,342 articles and co-word analysis through the Biblioshiny application. This structure identifies connections between key concepts in the field. Keyword co-occurrence analysis was primarily utilized to identify future research themes and construct this framework. The results are outlined in the next sections: Keyword co-occurrence analysis.

Keyword Co-occurrence Analysis

A review corpus of 1,342 articles was used to study keyword co-occurrence and build the conceptual structure. The analysis focused on authors' keywords, grouping them in clusters on the basis of shared themes. This helped identify key themes within the clusters that received significant attention.

Figure 2 shows that the keywords are grouped into two clusters, each marked by a different color. These clusters represent themes in AI and sustainability research across various industries, which are discussed in detail.

Cluster 1 (Red Color): Drivers of AI Adoption for Sustainability

The keywords analysis for Cluster 1, highlighted in red (Figure 2), reveals that studies in the area of AI and sustainability primarily focus on various aspects that influence, in one way or another, the acceptance or usage of AI in promoting sustainable practices across diverse contexts.

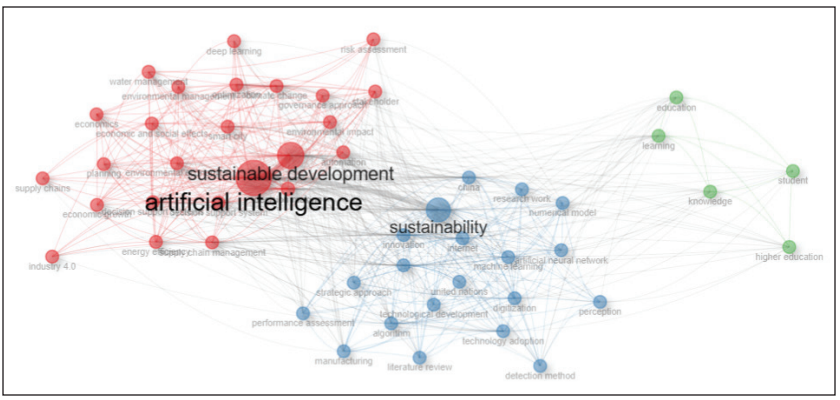

Figure 2. Keyword Co-occurrence Analysis.

Source: Authors' Extraction from Biblioshiny application.

Remarks: Every node indicates a keyword, and the connection between them indicates how often the keywords co-occur. Thicker lines indicate more frequent co-occurrence. Circles that are in proximity indicate a stronger association between the keywords, and their colors represent the clusters they belong to.

AI has become a revolutionary factor in a variety of industries, driving significant advancements and yielding substantial benefits. Various researchers explore different concepts as drivers or motivators, such as technological capability, innovation investment, environmental awareness, perceived responsibility for the environment, sustainable choices, AI-powered risk mitigation, green innovation, sustainable performance, AI capability, innovative culture, artificial intelligence management, knowledge sharing, etc.

Cluster 2 (Blue Color): AI-driven Sustainability Across Domains

The analysis of keywords in Cluster 2, highlighted in blue (Figure 2), indicates that AI and sustainability research primarily focuses on its applicability across various sectors such as fashion, tourism, manufacturing and energy. The coronavirus pandemic disrupted supply chains and exposed vulnerabilities, highlighting the potential of advanced technologies and their collaboration to mitigate these challenges. Using technology to boost sustainable fashion can create new opportunities for growth and innovation in the post-pandemic era. In Human Resource Management, the capabilities of Smart Technology, AI, Robotics, including Algorithms, have influenced Green HRM practices and environmentally friendly outcomes in the manufacturing sector. Leveraging Generative AI, natural language processing, and the Internet of Things enhances the efficiency of decision-making and travel organizing in smart tourism destinations. Technologies like AI, IoT, and DLT could completely change how energy systems work in the future.

Cluster 3 (Green Color): AI for Sustainable Learning

The keyword analysis for Cluster 3, shown in green (Figure 2), shows that AI research is mainly focused on its use in digital learning. While the SDGs are

widely acknowledged but there has still been a paucity of research on how educational programs help students understand and commit to them. Implementing environmental sustainability through the adoption of AI in colleges and universities is a lengthy endeavor that requires both financial as well as human capital. AI-supported learning promotes environmental responsibility, increases availability and reduces ecological damage by maximizing resources and reducing the utilization of tangible resources. Students acknowledge the efficiency of AI but worry about its effects on learning quality and academic integrity. Higher education institutions must create educational policies that encourage the incorporation of AI while ensuring its moral execution.

Discussion and Conclusion

This study provides a critical assessment of the application of AI across different sectors and identifies potential domains for further inquiry through the organization of existing research. For this study, a bibliometric analysis was conducted on 1,342 articles on AI adoption while ensuring sustainability published during 2014 and 2024 in the database of Scopus. The findings indicate a notable increase in literature on AI and sustainability across several industries, particularly since 2019. Furthermore, this publication trend revealed that studies on AI and sustainability is suitable for publication not only in marketing journals but also in journals from other fields, like *Sustainability (Switzerland)* (414 articles) and *Journal of Cleaner Production* with 90, and *Sustainable Cities and Society* with 39 were the most popular. It is essential to remember that the writing style and research focus are critical for establishing an effective presence in the field. A robust as well as well-detailed article is essential for successful publication and generating citations.

Additionally, the analysis of contributors' performance revealed Liu Y as the most prolific author, having 16 publications. The focused area of Liu Y was to investigate the effect of artificial intelligence, transformation and managerial innovation on efficiency and long-term development, specifically in emerging economies like China.

In terms of contributions by countries, developed economies, including China, Italy, the United States, and the United Kingdom, are at the leading edge of AI and sustainability research, reflecting their advanced regulatory frameworks and growing demand for sustainable innovations. In contrast, developing nations like India and Canada are becoming key contributors.

The keyword co-occurrence analysis in the last stage of bibliometric analysis revealed three distinct clusters, each shows various concepts and their importance in the field. The main themes of identified clusters are factors that influence the adoption of AI and sustainability, AI and sustainability application across industries, such as fashion, tourism, and energy, and AI application in digital learning. These conceptual clusters identified by keyword analysis serve as a strategic guide for both corporate and public organizations, supporting them in combining technological initiatives with overall sustainability goals.

Specifically in the Indian context, as highlighted in Table 5, the country has made great progress as an emerging contributor in the combined field of AI and sustainability. With a total of 1,194 citations and an average of 16.60 citations per article, India is increasingly gaining recognition in this evolving research domain. Leading this scholarly activity are authors such as Gupta S and Kumar A, each with nine publications, and Chatterjee S, with eight publications, as shown in Table 4. These authors are pioneering research into the intersection of AI and sustainability within the Indian context.

However, it is pertinent to point out that while the collaboration between AI and sustainability is still in its initial phase, it represents a rapidly growing field of enquiry that needs further investigation and focused efforts, especially in developing nations like India. The potential of AI to drive sustainability solutions is immense, but it is essential to continue further study in this domain to fully harness its capabilities.

Although this article offers valuable insights into the current landscape of AI and sustainability research, yet is not without limitations. These limitations are acknowledged in the following sections, along with suggestions for potential areas of future research. Expanding the scope of collaboration, increasing investment in AI technologies, and addressing the gaps in knowledge will be crucial for advancing this interdisciplinary field, particularly in developing economies such as India.

Future Directions of the Study

According to the study's conclusion and existing literature, some potential fields for further research are: First, future studies should move beyond simply understanding the potential impacts of AI in a single field, to exploring both its positive and negative consequences across social, environmental, and economic dimensions.

Second, there has not been enough or little research conducted on teaching and learning. The extensive application of AI technology in actual teaching and learning could be explored in further studies.

Third, most research is focused on fashion, tourism, manufacturing and energy services. However, there is less research that focuses on wholesale trading, mining, fishing, agriculture, forestry, and public administration, which could be explored more in further research with regard to their application in the field of AI and sustainability.

Fourth, future researchers could study the comparison of developing and developed countries with respect to this interaction to make their findings more impressive.

Limitations

Despite the theoretical contributions of the study, there are still a few limitations related to its approach. First, the Scopus database was the only source of data utilized in the study. While the use of Scopus has been justified, there is a chance

that some relevant articles from other databases were overlooked. Therefore, future reviews on AI and sustainability should consider including articles from these databases to either support or challenge the findings of this review. Second, due to the large volume of research articles on this topic, we limited the study to articles published in the past 10 years. This could present an opportunity for future research to explore earlier works in the field.

Declaration of Conflicting Interests

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Article

Unraveling FOMO Relations with Behavioral Biases on Investment Decision: A Study on the Psychology of Investor's Behavior

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Abstract

The continuous digital revolution has changed the way investors conduct research, exchange ideas, and carry out investment plans. Simultaneously, social media platforms have become vibrant sources of real-time market sentiment research, crowdsourcing investment ideas, and financial news. The core objective of the study is to examine the connection between fear of missing out (FOMO) and significant behavioral biases, including herd mentality, overconfidence, loss aversion, and availability heuristics. A qualitative study methodology was used, including a literature assessment of previous studies on behavioral finance, FOMO, and investing decisions. FOMO is the term used to characterize generalized anxiety that is brought on by the idea of losing out on something that other people find enjoyable or have. The results show that FOMO has a major impact on investors by increasing their emotional responses to market developments. This leads them to make illogical choices, emphasizing short-term rewards above long-term financial security. By analyzing the body of prior research and expanding the theoretical understanding of the intellectual underpinnings and social structure of behavioral biases, this study offers unique insights for government, policymakers,

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brokerage firms, financial planners, and investors. This study highlights the need to address digital and social media behavioral biases, which significantly impact investment decisions in an interconnected world.

Keywords

Herding bias, overconfidence, loss aversion, availability heuristics, FOMO, investment decision

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Introduction

Background of the Study

In recent years, the way people engage with investment possibilities has changed due to the fast expansion of technology and the increasing accessibility of financial markets (Idris, 2024). Decisions about the same significantly influence a family's ability to improve their quality of life and achieve financial contentment (Sahi et al., 2013). Barberis and Thaler (2003) demonstrated that since the family's financial situation is impacted by the investment selections, investors are more worried about potential losses, which has been defined as loss aversion in the prospect theory. Financial consumers now have a wealth of options for where to spend their savings in the present investing market (Sahi, 2017). To optimize their economic well-being, investors are unprepared to assess all the options. As a result, the person is forced to use specific decision-making processes and is swayed by feelings and psychological factors while choosing an investment. Fama (1997) stated in terms of their investment returns and market anomalies, investors often overreact and underestimate it. Due to a variety of factors, including age, gender, ethnicity, degree of education, and social and economic background, each individual is unique. Their largest challenge is choosing what investments to make; other than that, they act normally and rationally. They should consider their emotional inclinations and gut instincts while making investment decisions.

The idea that people do not always act rationally when making financial decisions and may be influenced by irrational factors that have the potential to lead to emotional (irrational) investment preferences is known as behavioral finance, and it is defined as the "emotional" feelings experienced by investors when investing (Ferreira, 2017). Emotional finance, fueled by psychoanalytic processes in the human mind, is similar to behavioral finance in that it discusses how an individual's unconscious needs, wants, and emotions influence their investing choices and, in general, how they affect the markets (Taffler, 2018). Studies on behavioral and emotional finance related to this topic often show that people's socio-psychological traits and demographics influence their investing choices and need to be looked into appropriately (Statman, 2014). This issue is not exclusive to individual equities; investors who use mutual funds rather than individually purchasing stocks are also susceptible to similar biases while investing in the equity market.

Fear of Missing Out (FOMO)

FOMO is the emotional reaction to the belief that others are partaking in an event, opportunity, or reward from which one feels excluded. The feeling of isolation and the desire to avoid remorse may prompt people to behave impulsively, motivated by fear rather than logical reasoning (Idris, 2024). The increasing prevalence of digital platforms that facilitate instantaneous access to information and constant connectivity has coincided with the emergence of FOMO as a recognized psychological phenomenon. FOMO can also manifest when people make decisions solely because others are doing so, resulting in a lack of digital presence (Tandon et al., 2021). A concept that researchers have investigated in the context of cognitive bias is herding bias, which is quite similar. Herding behavior is the inclination of individuals to emulate the actions and decisions of a larger group, regardless of whether or not those actions and decisions are rational or logical (Ansari & Ansari, 2021). In financial markets, herding behavior may result in asset price bubbles and collapses, as investors emulate the actions of others without evaluating their own understanding of market circumstances (Naina & Gupta, 2022). FOMO has become a more pronounced problem, mostly fueled by digital advancements in financial services. Traditional behavioral biases like herd mentality, overconfidence, loss aversion, and availability heuristics have always impacted investor behavior, but contemporary technology has amplified these impacts (Idris, 2024). Social media platforms, online trading applications, and real-time market updates provide an incessant flow of information, often tailored to emphasize success narratives or market trends, intensifying a pervasive feeling of urgency and anxiety of lost chances. Gamified elements in trading platforms and the impact of financial influencers connect conventional biases with contemporary technology, making FOMO a dominant catalyst for impulsive and emotionally driven investing choices in the current digital era (Bomnüter et al., 2023).

Purpose of the Study

This study aims to examine the correlation between FOMO and significant behavioral biases—herd mentality, overconfidence, loss aversion, and availability heuristics—and to analyze how this psychological phenomenon influences the strategies and decision-making processes of investors. The research seeks to comprehend how FOMO mediates biases in investor behavior by analyzing theoretical frameworks, existing literature, and contemporary developments in digital trading platforms and social media impact, often resulting in illogical and emotionally driven market activities. This research aims to provide insights into the impact of FOMO-driven behavior on individual investment results and overall market dynamics by combining data from previous literature.

Literature Review

The phenomenon of FOMO has garnered considerable attention within behavioral finance, particularly regarding its influence on investing choices. Numerous

research studies have examined the interaction between FOMO and various cognitive and emotional biases that impact investor behavior in diverse markets, especially in contexts driven by digital and social media. These studies highlight the growing prevalence of FOMO within volatile markets such as cryptocurrencies, stock trading, and the emergence of neo-broker platforms that are significantly intertwined with social media functionalities.

Friederich et al. (2024) investigate the influence of psychological variables, such as FOMO, on consumer participation in the Bitcoin market despite its intrinsic volatility and recurrent downturns. FOMO substantially influences investing choices, with emotional processes mitigating this impact and impulsivity serving as a moderator. The research indicates that FOMO appeals result in repeated investing choices despite previous losses, demonstrating the enduring nature of this psychological bias. Moreover, it is proposed that fear-based advertising may effectively mitigate the effects of FOMO, which has significant implications for scholars examining investor behavior and regulators aiming to oversee consumer participation in the cryptocurrency market.

Idris (2024) examines the influence of FOMO on overtrading, speculative investment, and the creation of asset bubbles within conventional stock markets. Their study highlights the emotional intensification induced by FOMO, resulting in illogical, short-term choices that favor instant rewards above long-term financial security. Proponents contend that social media and technology intensify the issue by promoting herd behavior and market instability, as shown by "meme stocks." Young investors are particularly vulnerable to FOMO because of their dependence on social media for investing guidance, underscoring the need for financial literacy initiatives and regulatory measures to mitigate disinformation and the detrimental effects of FOMO-induced choices.

A significant topic of focus is the convergence of FOMO and gamification inside neo-broker platforms, which has emerged as a central theme in recent studies. Bomnüter et al. (2023) examine the impact of FOMO, in conjunction with the gamified elements of platforms such as Robinhood, on irrational investment behavior. Unlike other studies that examine them independently, this study mixes FOMO and gamification, highlighting their substantial influence on impulsive actions, especially among younger investors. The study indicates that social media-influenced neo-broker platforms exacerbate these impacts, resulting in emotionally driven investing choices. The research offers critical insights into the behavioral determinants of contemporary investment and underscores the impact of social media and gamification on financial decisions.

Research has also investigated the wider ramifications of FOMO on investor behavior in cryptocurrency markets. Kaur et al. (2023) examine the role of FOMO in mediating the interaction between biases such as herding, loss aversion, and overconfidence, particularly within the realm of cryptocurrency investing. FOMO significantly influences decision-making behavior, particularly in volatile markets such as cryptocurrency, where investors often make irrational decisions driven by the fear of missing possible rewards. This study corroborates the conclusions of Gupta and Shrivastava (2022), demonstrating that FOMO amplifies the influence of herding and loss aversion on retail investors' decision-making. Their research

indicates that FOMO mediates the connection between these biases, enhancing their impact on financial decisions and prompting irrational actions.

Shetty et al. (2023) and Gupta and Shrivastava (2022) investigate the impact of herding behavior and FOMO on investing choices in stock and retail markets. Their research underscores that FOMO, in conjunction with herd mentality, results in the creation of speculative bubbles and suboptimal investment decisions. This corresponds with the extensive studies into how behavioral biases such as loss aversion and herding influence market volatility and the emergence of bubbles. Shetty et al. (2023) underscore the significance of understanding the consequences of these biases to assist investors in making more prudent choices, hence fostering more sustainable investing practices.

The research emphasizes that information asymmetry intensifies the impact of FOMO on investment behavior. Güngör et al. (2022) examine how FOMO is often instigated by visual stimuli or media portrayals, although its effects may be alleviated when investors encounter credible financial facts. This study indicates that financial literacy and access to reliable information might mitigate the emotional impact of FOMO, resulting in more logical decision-making. Shiva et al. (2020) examine the impact of fear of missing out, in conjunction with information asymmetry, on investor behavior, especially in marketplaces characterized by unequal access to information. They contend that access to mobile devices and financial news via social media has introduced new hurdles for investors, exacerbating the risk of losing out on market opportunities and resulting in suboptimal financial decisions.

Kang et al. (2019) and Taffler (2018) examine the psychological foundations of FOMO, highlighting its impact on consumer behavior in both offline and online contexts. Their research indicates that FOMO is an influential factor in elucidating consumer uniformity and herd behavior, especially inside financial markets. The study highlights the role of unconscious emotional processes, including excitement, fear, and denial, in fostering irrational decision-making, a notion especially pertinent to the comprehension of asset price bubbles and the dynamics of financial crises. Taffler (2018) examines the influence of emotional drivers on asset management and asset price dynamics, highlighting the need to acknowledge unconscious mental processes in financial decision-making.

Finally, Riaz et al. (2012) examine the impact of risk perception, asymmetric information, and issue framing on investor behavior, especially on the phenomenon of FOMO. Their model demonstrates that investors' judgments are influenced by both their risk tolerance and the presentation of information. The research underscores the significance of framing in influencing investing decisions and the impact of psychological biases on risk perception.

The evidence repeatedly indicates that FOMO is a substantial catalyst for irrational investing behavior, affecting decision-making in many financial environments. The interplay between FOMO and several cognitive biases, including herding, loss aversion, and overconfidence, intensifies its effects, especially in risky markets such as cryptocurrency and stock trading. Social media, gamification, and information asymmetry exacerbate the consequences of FOMO, resulting in impulsive and risky investing choices.

The existing literature clearly demonstrates that FOMO is a crucial psychological phenomenon that greatly influences investor behavior, especially within digitally driven financial environments. The interaction with classical behavioral biases—herding, overconfidence, loss aversion, and availability heuristics—often results in impulsive and irrational investment decisions (Friederich et al., 2024; Idris, 2024; Kaur et al., 2023). Research indicates that FOMO amplifies emotional trading and frequently leads to recurring investment errors. Additionally, some studies highlight the influence of gamified trading platforms such as Robinhood, where FOMO transcends a psychological trigger and becomes an intentional design element that increases impulsivity (Bomnüter et al., 2023). Further research identifies FOMO as a mediator between behavioral biases and decision outcomes, particularly in contexts of information asymmetry, media hype, and real-time digital influence (Gupta & Shrivastava, 2022; Shetty et al., 2023). Nonetheless, while recognizing the significant impact of FOMO, existing studies primarily concentrate on particular markets like cryptocurrency or meme stocks, fail to provide cohesive frameworks that connect various behavioral biases with FOMO, and present restricted empirical validation across a range of investor demographics and digital contexts.

Research Gap

While there is an increasing amount of research in behavioral finance, current studies often focus on individual biases like herding, overconfidence, loss aversion, and availability heuristics separately and how these biases interact in the context of FOMO. Recent advancements in digital platforms and social media have heightened investment behaviors driven by FOMO; however, there is a scarcity of studies providing a comprehensive framework that examines FOMO as a mediating factor among various behavioral biases. Furthermore, a significant portion of the research is predominantly theoretical, with insufficient empirical validation across various investor segments or technological contexts (Argan et al., 2023; Güngör et al., 2022; Gupta & Shrivastava, 2021). The identified gap prompted this study to explore FOMO in conjunction with significant behavioral biases—herding, overconfidence, loss aversion, and availability heuristics—to gain a deeper understanding of their collective influence on investment decisions within the contemporary digitally driven financial environment (Figure 1).

Discussion

Herding Bias, FOMO, and Investment Decisions

Herding bias and FOMO significantly shape investor behavior and market dynamics. Herding bias, as noted by Nofsinger and Sias (1999), reflects investors' tendency to mimic others instead of making independent decisions, leading to a bandwagon effect (Dar & Hakeem, 2015). This behavior is exacerbated by FOMO, where investors fear missing out on potential gains that appear to be enjoyed by others. Gupta and Shrivastava (2022) highlight that this leads

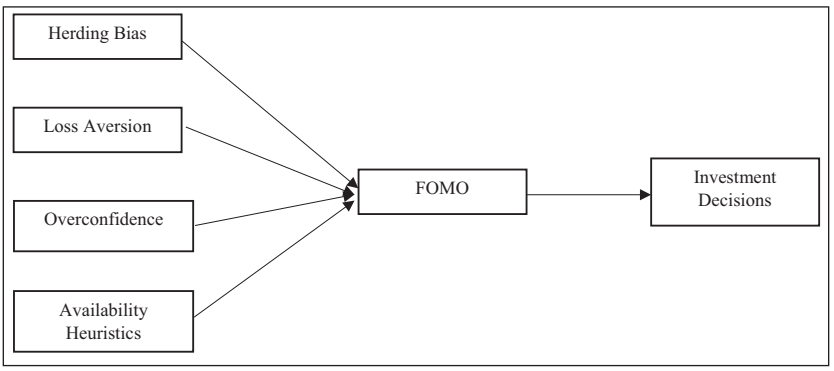

Figure 1. Conceptual Framework.

investors to follow market trends without adequate research, resulting in irrational choices. Historical examples, such as the dot-com bubble, the 2008 financial crisis, and the volatility surrounding meme stocks like GameStop, illustrate how herding and FOMO can create market instability, asset bubbles, and abrupt downturns (Shiller, 2000). In these scenarios, investors prioritized collective sentiment over individual analysis, leading to significant economic repercussions. But there are good things that may arise from FOMO as well. It may motivate investors to explore new opportunities and diversify their portfolios, especially in emerging markets or innovative sectors like technology and renewable energy (Baker et al., 2014). These positive outcomes indicate that FOMO, when combined with thorough research and a disciplined approach, can encourage informed risk-taking and foster engagement in growth opportunities.

Loss Aversion, FOMO, and Investment Decisions

Loss aversion and FOMO significantly influence investing behavior and market dynamics. Loss aversion, as described by Barberis and Thaler (2003), refers to investors' tendency to avoid losses rather than pursue equivalent gains, with losses impacting emotions approximately 2.5 times more than gains. Noah et al. (2021) note that this leads investors to prioritize capital preservation, often resulting in premature asset sales or overly cautious decisions. The combination of FOMO, which drives the fear of missing out on market profits, further intensifies this behavior, causing investors to follow group trends and make poor choices to avoid losses from not participating in lucrative opportunities (Dar & Hakeem, 2015). During the 2008 financial crisis, loss aversion led many investors to sell shares at their lowest, locking in losses instead of waiting for recovery. Simultaneously, FOMO-driven speculative investments in subprime mortgage-backed securities contributed to the bubble's formation and collapse (Shiller, 2015). The cryptocurrency market has also exhibited similar patterns, with retail investors experiencing FOMO during bull runs, leading to risky investments in assets like Bitcoin, followed by panic selling during downturns (Gupta &

Shrivastava, 2022). Nonetheless, FOMO may sometimes provide beneficial outcomes. It may inspire investors to investigate high-growth areas, such as technology or renewable energy, by instilling a feeling of urgency. Early investors in companies like Amazon and Tesla benefited from FOMO-driven decisions that were backed by thorough research and risk assessment (Baker et al., 2014). These examples suggest that when moderated by rational thinking, FOMO can lead to informed decision-making and long-term investment success.

Overconfidence, FOMO, and Investment Decisions

Overconfidence and FOMO significantly impact financial markets, shaping individual investing behaviors and broader market dynamics. As described by Hirshleifer (2015), overconfidence leads individuals to overestimate their knowledge and forecasting abilities, resulting in increased risk-taking. FOMO, driven by social influences and the fear of missing out on opportunities, often pushes investors toward short-term gains rather than long-term stability (Gupta & Shrivastava, 2022). These biases can distort rational decision-making, heighten market volatility, and contribute to financial instability (Dar & Hakeem, 2015). Historical examples illustrate the effects of these biases, such as during the late 1990s dot-com bubble, where overconfidence led investors to overvalue tech companies. At the same time, FOMO spurred herd behavior, resulting in a market crash (Shiller, 2015). Similarly, the GameStop incident in early 2021 showcased how retail investors' overconfidence, amplified by FOMO and social media, caused significant price fluctuations and highlighted the risks of herd-driven markets (Kim et al., 2023). However, FOMO can also have positive effects, motivating investors to pursue high-growth opportunities, as seen with early adopters of renewable energy stocks and cryptocurrencies (Baker et al., 2014). Additionally, it may encourage individuals to seek financial advice, conduct research, or diversify investments to avoid missing out on potential profits.

Availability Heuristics, FOMO, and Investment Decisions

Availability heuristics and FOMO significantly impact financial decision-making and market dynamics. Availability heuristics, as defined by Ising (2007), refer to the cognitive bias where individuals rely on readily accessible information, often neglecting a comprehensive analysis of relevant facts. This bias can lead to FOMO, where consumers make financial decisions based on superficial information suggesting profitable opportunities. Güngör et al. (2022) note that this interplay can intensify herd mentality, causing investors to follow trends without careful analysis, resulting in poor financial decisions. Historical examples highlight the financial repercussions of these biases. The 2008 financial crisis was worsened by availability heuristics, as investors overestimated the housing market's stability due to prolonged price increases. FOMO drove investors to purchase mortgage-backed securities without understanding their risks, contributing to a market collapse (Shiller, 2015). Similarly, during the 2017 Bitcoin surge, many investors, swayed by accessible success stories and media hype, succumbed

to FOMO, leading to significant losses when the market declined. However, FOMO and availability heuristics can also yield positive outcomes. In emerging sectors like renewable energy or technology, FOMO has encouraged investments that later proved profitable. Investors capitalizing on accessible data about the rising demand for green technology have achieved substantial long-term gains (Baker et al., 2014). Additionally, FOMO can engage novice investors, enhancing financial inclusion and market liquidity.

FOMO and Investment Decisions

Since almost everyone now uses mobile phones, an essential part of everyday life, people are experiencing more FOMO since they spend more time in the virtual world. The "Fear of Missing Out," or FOMO, is a typical feeling that may surface about the investing market. It is the uneasy or regretful sensation that someone may have when they think others are making money off of a particular investment opportunity while they are not (Shetty et al., 2023). Relationships between these factors have been identified via several research studies (Eide et al., 2018; Kang et al., 2020; Mostyn Sullivan et al., 2021) on FOMO and engagement conducted in a variety of industries (product, brand, social media, mobile phone, employment, social network, sports team, etc). According to this research, investors may suffer from FOMO and seek more information and investment news to allay their anxieties. This is because they have more financial investment options and want to make more money in riskier situations, especially among young people, who want to maintain connections on the social media sites in which they are interested. According to Cipriani and Guarino (2005), investors may disregard their own expertise to adhere to the timing of other investors' choices. Based on research on FOMO in the literature and conversations among researchers on social media, consumer, brand, and financial involvement (Alt, 2018; Przybylski et al., 2013) Through their interactions with other investors, sharing their investments on social media and within their traditional circles, and tracking and comparing the profit and loss of both their own investment decisions and other investment choices that they have not invested in, it is evident that individual investors may try to stay aware of the investments of others in order to avoid missing out on developments related to their investments.

Conclusion

The study indicates that herd mentality, overconfidence, loss aversion, and availability heuristics together influence financial investment decisions via the lens of FOMO. Investors often yield to herd mentality and experience heightened FOMO as they worry about missing out on collective gains. The heightened FOMO on social media fosters a herd mentality when investors uncritically adhere to trends instead of cultivating their educated perspectives. This challenges beginner investors, exacerbating the already high market volatility. On the other hand, if one is overconfident, they may invest impulsively and believe in their skills to capitalize

on chances to an excessive degree. While availability heuristics cause people to behave irrationally due to distorted views of current trends or vivid success stories, loss aversion links FOMO to the fear of missing out on possible earnings, which drives risk-averse or excessively cautious behaviors. These biases, using FOMO as a mediator, lead to investing decisions guided by emotions. In the future, researchers may use neuroeconomic approaches to uncover cognitive processes in experimental or longitudinal investigations, which might help them better comprehend these dynamics. Some other factors that can help us understand how to mitigate the influence of FOMO on investing choices include demography, market conditions, the effects of digital platforms, and the efficacy of behavioral interventions.

Suggestions and Policy Implications of the Study

Theoretical considerations suggest that traditional financial models must include psychological and emotional factors, such as the FOMO, which hinder rational decision-making. Social comparison prompts investors to prioritize short-term gains over long-term strategies. As an investor in management, you may mitigate the effects of emotional investing by enhancing financial literacy and promoting disciplined, long-term investment strategies. Government engagement, particularly on social media platforms, may diminish the occurrence of misinformation and rampant speculation. A further strategy to combat the FOMO is to advocate for long-term investment strategies that take environmental, social, and governance factors into account and create a healthy financial climate by educating people, regulating the industry, and using financial technology to help investors adopt more stable and reasonable investing practices.

To alleviate FOMO-induced market behavior, authorities should emphasize the improvement of financial literacy to assist investors in understanding biases, especially FOMO. They must mandate more openness from digital trading platforms and financial influencers, guaranteeing explicit risk warnings and disclosures of conflicts of interest. Regulating gamification elements, such as incentives and leaderboards in trading applications, helps mitigate impulsive behavior. Moreover, platforms must provide real-time risk alerts, especially for high-risk investments, while authorities must monitor social media to identify misinformation and market manipulation. Promoting long-term investment methods instead of short-term speculation is essential for cultivating a more stable market.

Limitations of the Study and Future Prospects

This article's shortcomings stem from its dependence on current literature and conceptual frameworks, which may inadequately represent the intricacies of real-time market dynamics affected by FOMO and behavioral biases. The research mostly emphasizes psychological and theoretical dimensions, excluding actual data or real-world case studies, thereby limiting its practical usefulness.

Research in the future may make use of state-of-the-art techniques, such as artificial intelligence-driven sentiment analysis, to monitor investors' actions on social media in relation to FOMO in real time or to forecast the impact of biases on investor behavior using machine learning models. To investigate the brain circuits linked to FOMO and bias-driven decision-making, researchers might use cutting-edge neuroeconomic methods, such as functional magnetic resonance imaging. Incorporating factors such as the function of algorithmic trading platforms, the effect of tailored investing applications, and the connection between digital platforms and financial influencers might also provide fresh aspects to the research. To get a new understanding of how to reduce irrational investing choices, it would be interesting to study how FOMO-driven behaviors vary between cultures or how financial knowledge and psychological resiliency moderate this impact.

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Article

Dynamics of Financial Literacy, Savings Behaviour and Entrepreneurial Intention: Insights from a Study of Northern India

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Abstract

The well-being of an economy depends mostly on a multitude of aspects which work jointly to maintain the economy of any country running. Financial literacy, saving behaviour and entrepreneurial intention are a few of these aspects which play a quintessential role in the smooth functioning of an economy, and hence it is pertinent to delve into these factors. As an outcome, the primary aims of this research study are to utilize primary data and to measure the diverse relationships among these factors. The objectives of this research article are to measure the connection amongst saving behaviour and financial literacy, entrepreneurial intention and financial literacy, and entrepreneurial intention and saving behaviour. A total of 169 respondents from various states of northern India became a part of this research study. A convenience method of sampling was used for the selection of the sample, and required figures were collected with the use and help of online questionnaires. Hypotheses were formed, and different statistical computations and calculations were applied for testing various hypotheses. Many meaningful inferences were made, and the findings offer insights for financial institutions and policymakers to make a valuable contribution to this field of research.

Keywords

Financial literacy, entrepreneurial intention, saving behaviour, Northern India
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Introduction

Financial literacy is the aptitude to understand and utilize fundamental concepts related to finance while dividing financial resources for investment and identifying market opportunities (Li & Qian, 2020). It focuses on and refers to the capability of a person to oversee their personal finances. Individuals who are experts at managing their finances will effortlessly fulfil their future obligations. Financial literacy deals with individuals' financial security (Ali et al., 2021). Many researchers (Hilgert et al., 2003; Klapper et al., 2015; Li & Qian, 2020) recognized that highly financial literate people have the capability of managing risk and identify various business opportunities, which can lead to understanding of entrepreneurial development and growth and helps in gaining financial knowledge.

These days, as the improved standard of living and stable financial health are gaining importance, international financial markets are offering a wide range of investment opportunities. Financial planning is becoming more of an acceptable practice. Among the current deviations in financial markets related to finance, it is more important nowadays for consumers to manage their finances with greater knowledge and skill. The factor responsible for this is the fact that modifications in financial markets have a greater variety of products related to investment and finance and financial services available, necessitating the making of complex decision-making for finance.

Financial literacy fosters the cultivation of market knowledge, familiarity with financial insight, finance sources and entrepreneurial aspirations among individuals (Hilgert et al., 2003; Levesque et al., 2009; Li & Qian, 2020). Entrepreneurial intentions help engage people in various entrepreneurial activities. Being an entrepreneur is a valuable career choice. Self-reliance and self-direction are becoming more and more preferred in individual job choices (Baruch, 2004; Gibb, 2002a, b; Hall, 2002). The term 'entrepreneurship' has been defined as beginning one's own firm or a work attitude that prioritizes initiative, self-reliance, risk-taking and creativity (Bruyat & Julien, 2001). Entrepreneurship is mainly considered a risky prospect, although encouraging entrepreneurship will lead to increased economic development and poverty alleviation.

A nation's economic forecasts and well-being are enhanced by entrepreneurship, which also generates income, expands job opportunities and increases demand across a range of industries (Acs & Szerb, 2010; Morrison & Johnson, 2003; Sadler-Smith, 2003; Timmons, 1999). Entrepreneurs who are in the budding stage, they must have financial awareness and develop the habit of saving money. Potential entrepreneurs are individuals who have high self-confidence, risk tolerance and willingness to innovate (Koh, 1996; Nasip et al., 2017). As per Krueger et al. (2000), entrepreneurial intentions refer to a person's choice to start a business, their natural inclination towards entrepreneurship and their attitude and expectations about being involved in entrepreneurial activities.

To smoothly and successfully run a business, entrepreneurs need to be financially stable and literate. Studies reveal that their operations are restricted by a lack of financial knowledge and inefficient management. They must, therefore, be able to fill in the gaps by making up for any shortcomings in the financial market

to assist the entrepreneurial process. Like high-income countries, in lower-middle income countries, entrepreneurship promotion has grown significantly since it fosters entrepreneurial qualities and increases a nation's ability to compete and prosper economically. The economy benefits from saving because money invested in financial assets is then used by businesses to finance their investments through financial intermediaries.

Saving behaviour and even entrepreneurial intentions affect financial literacy directly and indirectly. Saving is mostly that portion of income which is not spent. Savings are necessary for the nation's economy to grow since low savings rates reflect towards poor investment and low capital formation. A nation's high savings rate can also protect it from financial crises and recessions. According to Horrod (1939) and Domar (1946), the ability to save money and the savings rate influence how quickly the economy is growing because more savings will affect a greater degree of investment in the nation, which in exchange promotes national economic growth. Saving behaviour helps in attaining financial objectives and creating wealth. Individuals with strong saving behaviour have a greater probability of gathering capital to invest and have all the required resources for pursuing all available entrepreneurial opportunities.

Literature Review and Hypothesis Development

Financial Literacy

According to Brown et al. (2006), financial literacy is the ability and competency that facilitates individuals to respond effectively to ever-changing personal and economic circumstances. Garman and Forgue (2006) defined financial literacy as having adequate knowledge of facts and terms required for successful personal financial management. Furthermore, according to the definition propounded by Anthen (2004), financial literacy means having the capability to know, analyse, manage and talk about your personal financial situation. Huston (2010) proposes that financial literacy is a skill that helps people to make financial decisions effectively. It is necessary to take sound financial decisions related to investment and ultimately achieve one's own financial goals and well-being. Financial literacy, according to the OECD, involves having awareness, knowledge, skills, attitudes and behaviours related to money matters. According to Chen and Volpe (1998), financial knowledge includes general knowledge related to personal finance, savings and loan, insurance and investment.

Saving Behaviour

In economics, saving means the money that has left after you have spent on your needs and wants over a specific time period (Browning & Lusardi, 1996; Warneryd, 1999). In general, we can define saving as that part of income that is not consumed (Lee & Hanna, 2015). Saving is seen as crucial for fostering long-term economic growth and establishing a link amongst a country's past, present and future. Total savings represent the portion saved from the current income. The

primary reasons for saving include preparing for future transactions, as a precautionary measure, and for speculative purposes.

Entrepreneurial Intention

Akanbi (2016) propounded that entrepreneurship is not only about finding and filling gaps in the market but also about a process of discovering the true entrepreneurial potential, evaluating the risks and taking chances to create future products. According to Fuadi (2009), the entrepreneurial interest is demarcated as a wish and readiness to work rigid without being anxious about the financial risk that will occur in entrepreneurship, and also willing to gain knowledge from the breakdowns. According to Hermawan (2005), the entrepreneurial interest is an attraction in a person towards entrepreneurial activity, and their wish to be involved in entrepreneurial activity.

H_1: There is an association between financial literacy and saving behaviour.

This research work is built upon the first hypothesis that there exists a relation between financial literacy and saving habits. Various studies have delved into the correlation of these variables. According to Sulong (2017), there is a positive correlation between saving behaviour and financial literacy. Students who have higher levels of financial knowledge are more likely to save or invest. Clark and Madeleine (2008) showed that addressing the problem of decreased savings can be effectively tackled through financial literacy initiatives and financial planning. Also, Mahdzan (2013) found that literacy related to finance indirectly impacts household saving behaviour by significantly affecting the planning. Afsar et al. (2018) found that students who have higher financial literacy tend to exhibit more saving behaviour compared to those students who have lower financial literacy. Mahdzan (2013) demonstrated that financial literacy plays an indispensable role in determining individual saving habits. Jamal et al. (2015) suggested through multiple regression statistical tools' analysis that family and peers and financial literacy are influential factors on students' saving behaviour. Sabri and MacDonald (2010) similarly concluded that possessing financial literacy meaningfully impacts the saving behaviour of college-going students. Stolper and Walter (2017) argued that financial literacy benefits individuals, businesses and families by promoting wise saving and investment practices. Mahdzan and Tabiani (2013) discovered that financial literacy positively influences personal savings. Furthermore, Mohamad Fazli and MacDonald (2010) highlighted that individuals who have better financial literacy and saving behaviour are inclined to have fewer financial problems, indicating a negative correlation.

H_2: There is a correlation between financial literacy and entrepreneurial intention.

Our study's second hypothesis suggests a correlation between financial literacy and entrepreneurial intention. Financial literacy mainly influences entrepreneurial intentions, as persons who have a better level of financial literacy incline to pursue entrepreneurial endeavours (OECD, 2019). In high-income countries

compared to lower-middle income countries, Gnyawali and Fogel (2014) discovered that financial knowledge motivates people to jump into their own business. Hilgert et al. (2003) and Bilal et al. (2021) also found a correlation between understanding money and the desire to become entrepreneurs. Ojogbo et al. (2022), however, reported no correlation between financial literacy and entrepreneurial intention. Conversely, Song et al. (2020) mentioned a positive association between entrepreneurial intention and financial literacy. According to Aldi et al. (2019), financial literacy influences entrepreneurial interest. Additionally, Bilal et al. (2021) stated that better financial knowledge and attitudes boost the chances of activities of the entrepreneurial intentions amongst youth. Kang et al. (2024) suggested that financial literacy partially positively affects entrepreneurship and entrepreneurial intention. Ojogbo et al. (2022) also proposed in the research study that entrepreneurship education positively impacts entrepreneurial intentions of graduates.

H_3: There exists a correlation between saving behaviour and entrepreneurial intention.

Shrestha and Rawat (2023) found strong positive connections between saving money and the desire to commence a business. Their research highlights the role of saving for aspiring entrepreneurs, as it assists in resource accumulation, promotes financial responsibility and demonstrates commitment to business endeavours. Similarly, Amofah et al. (2020) found a relation between saving money and entrepreneurial aspirations, which suggests that people who save more money are more inclined towards business ownership. Moreover, saving money reflects a skill of an individual to delay gratification and focus on long-term goals, essential qualities for entrepreneurship (Cho, 2009; Dunn & Holtz-Eakin, 2000; Kilara & Latortue, 2012). Developing good saving habits can foster an entrepreneurial mindset and facilitate wealth accumulation (Bosumatari, 2014). Entrepreneurial success is closely associated with prudent saving practices, as saving serves as a resource to gather funds (Erskine et al., 2006; Rikwentishe et al., 2015).

Research Methodology

Research Hypotheses

This research is based on the following hypotheses:

H_{01}: There is no association between financial literacy and saving behaviour.
H_{02}: There is no correlation between financial literacy and entrepreneurial intention.
H_{03}: There is no correlation between savings behaviour and entrepreneurial intention.

Research Objectives

This study is undertaken to fulfil the following objectives:

1. To evaluate if there is any relationship between financial literacy and saving behaviour.
2. To infer if there is an association between financial literacy and entrepreneurial intention.
3. To evaluate if there is any correlation between saving behaviour and the entrepreneurial intention of respondents.

Data Collection

The study employs a mix of convenience methods of sampling, wherein the respondents were selected as per the requirements of this study. A total of 169 respondents became part of the research study, which included both males and females with varied designations. The questionnaire method was utilized for the entire data collection wherein questionnaires were designed and thereafter circulated online.

Instrument Design

For achieving the objectives of the research study, three parameters were utilized: financial literacy, saving behaviour and entrepreneurial intention. For financial literacy, a complete set of nine indicators was selected, drawn from the works of Ali et al. (2022) and Harahap et al. (2022). Regarding saving behaviour, eight indicators were chosen, adapted from Ali et al. (2022) and Zulaihati et al. (2020). Lastly, eight indicators were employed for measuring entrepreneurial intention, with questions modified to ensure clarity and understanding among respondents.

Data Analysis

For this study, the SPSS software was used to calculate the correlation among various variables. As described above, this study intends to analyse three relationships: first, between financial literacy and saving behaviour; second, between financial literacy and entrepreneurial intention and, third, between saving behaviour and entrepreneurial intention. This section presents the results of these associations.

Table 1 explains the association between financial literacy and saving behaviour. Based on Table 1, we deduce that the correlation coefficient between these two variables is 0.442. This directs a statistically significant positive correlation between financial literacy and saving behaviour, suggesting a direct relationship between the two. In simpler terms, individuals with greater levels of financial literacy tend to save more money. This finding aligns with the conclusions drawn by Sulong (2017), Mahdzan (2013), Afsar et al. (2018), Jamal et al. (2015) and Sabri and MacDonald (2010).

Table 2 demonstrates that the correlation between financial literacy and entrepreneurial intention is also positive and statistically significant at 0.245. This

Table 1. Correlation Between Financial Literacy and Saving Behaviour.

		Mean_FL	Mean_SB
Mean_FL	Pearson correlation	1	0.442**
	Sig. (2-tailed)		0.000
	N	169	169
Mean_SB	Pearson correlation	0.442**	1
	Sig. (2-tailed)	0.000	
	N	169	169

Notes: **Correlation is significant at the 0.01 level (2-tailed).

FL: Financial literacy; SB: Saving behaviour.

Table 2. Correlation Between Financial Literacy and Entrepreneurial Intention.

		FL_Mean_Score	EI_Mean_Score
FL_Mean_Score	Pearson correlation	1	0.254**
	Sig. (2-tailed)		0.001
	N	169	169
EI_Mean_Score	Pearson correlation	0.254**	1
	Sig. (2-tailed)	0.001	
	N	169	169

Notes: **Correlation is significant at the 0.01 level (2-tailed).EI: Entrepreneurial intention; FL: Financial literacy.

indicates that the individuals with higher financial literacy are expected to harbour higher entrepreneurial intentions. However, a correlation coefficient of 0.245 suggests a weak to moderate positive relationship amongst these variables, implying that while there is a tendency for those with greater financial knowledge to exhibit an inclination towards starting a business, the association is not exceptionally strong. This finding resonates with the conclusions drawn by Gnyawali and Fogel (1994), Hilgert et al. (2003), Song et al. (2020), Aldi et al. (2019), Bilal et al. (2020) and Kang et al. (2024).

Table 3 elucidates the correlation between saving behaviour and entrepreneurial intention. From the table, we infer that the correlation coefficient among the variables is 0.188, which is positive and statistically significant at the 0.05 level. This suggests a relatively weak relationship between saving behaviour and entrepreneurial intention. It leads to the implication that individuals who save more have a propensity to be more prone to express interest in starting a business, although the connection is not as strong as observed in the other two relationships. However, the result here contrasts with the results of Shrestha and Rawat (2023), Amofah et al. (2020), Bosumatari (2014), Erskine et al. (2006) and Rikwentishe et al. (2015).

Table 3. Correlation Between Saving Behaviour and Entrepreneurial Intention.

		SB_Mean_Score	EI_Mean_Score
SB_Mean_Score	Pearson correlation	1	0.188*
	Sig. (2-tailed)		0.014
	N	169	169
EI_Mean_Score	Pearson correlation	0.188*	1
	Sig. (2-tailed)	0.014	
	N	169	169

Notes: *Correlation is significant at the 0.05 level (2-tailed).

EI: Entrepreneurial intention; SB: Saving behaviour.

Findings and Suggestions

This research study has exposed several significant findings and implications. First, it reveals a positive correlation between financial literacy and saving behaviour, which shows that people with better financial literacy tend to have better saving habits and vice versa. This suggests that imparting more financial literacy in instruction can help regulate saving behaviour, which is crucial for economic development. Policymakers could use financial literacy initiatives to encourage better saving habits, thereby contributing to the overall economic well-being.

Second, the research highlights a correlation between financial literacy and entrepreneurial intention, pointing towards the fact that individuals having better financial literacy are more inclined towards entrepreneurship. This underscores the need to increase financial literacy levels among the population to foster entrepreneurial intentions. By enhancing financial literacy, policymakers can potentially stimulate entrepreneurial activities, which are quintessential for economic growth and innovation.

Lastly, the study indicates a somewhat weak and statistically insignificant connection between saving behaviour and entrepreneurial intention. While saving behaviour may not strongly influence entrepreneurial intentions, the findings still emphasize the significance of promoting financial literacy. Improving financial literacy can indirectly impact both saving behaviour and entrepreneurial intentions, offering valuable opportunities for policymakers to enhance financial well-being and economic development.

Study Limitations and Scope for Future Research

While this research study offers valuable insights, it is important to acknowledge its challenges and limitations. First, the respondents in the sample do not include an equal number of males and females, which hinders the ability to conduct a comprehensive comparative analysis between these groups. Second, the size of the collected sample could be increased. However, due to the lack of time, more

responses could not be collected. This could be further explored by future researchers through larger sample sizes or by examining different variables. Despite these limitations, the research undoubtedly contributes significantly to the knowledge of financial literacy, saving behaviour and entrepreneurial intentions by shedding light on their interrelationships.

Conclusion

This study successfully explored the synergy between financial literacy, saving behaviour and entrepreneurial intentions among individuals in the Tricity region. The findings indicate that financial literacy has a significant and positive impact on both saving behaviour and entrepreneurial intentions, confirming the essential role of financial awareness in promoting responsible financial actions and an entrepreneurial mindset. However, the correlation between saving behaviour and entrepreneurial intention, though positive, appeared to be weak.

The results emphasize the importance of strengthening financial education programmes and encouraging saving habits, especially among youth and aspiring entrepreneurs. These findings provide valuable insights for educators, financial institutions and policymakers to design strategies that foster entrepreneurship and financial responsibility, ultimately contributing to economic growth. Despite certain limitations, this study lays a foundation for further research with larger and more diverse samples and deeper exploration of other contributing variables.

Declaration of Conflicting Interests

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Article

A Bibliometric Analysis of Social Media Marketing and Customer Engagement in Retail (2016–2024)

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Abstract

In recent years, both academia and industry have shown growing interest in social media marketing (SMM) due to its transformative role in enhancing customer engagement. Despite this rising importance, academic literature on SMM remains relatively underdeveloped. This study aims to present a bibliometric overview of research trends and thematic evolution in the domain of SMM and customer engagement. A total of 124 publications from 2016 to 2024 were retrieved from the Scopus database, with selection limited to English-language journal articles in the subject area of business, management and accounting. Utilizing the R-based Biblioshiny package and VOSviewer for bibliometric mapping and network analysis, the study explores key authors, journals, keywords and collaborative patterns in the field. The results indicate a significant growth in scholarly interest over the past decade, identifying clusters around customer engagement strategies, digital platforms, content marketing and influencer dynamics. However, several critical aspects—including regulatory concerns, integration of artificial intelligence and platform-specific practices—remain underexplored. The findings provide a foundational understanding of the intellectual landscape of SMM research and can guide future academic and practical endeavours by highlighting gaps and emerging opportunities. This study contributes to digital marketing literature by offering a structured roadmap for researchers and practitioners interested in leveraging SMM more effectively.

Keywords

Social media marketing, digital marketing, bibliometric analysis, Biblioshiny
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Introduction

Social media has influenced marketing practices significantly by altering the ways organizations interact with consumers. Social media platforms, such as Instagram, Facebook and Twitter, offer services for direct communication, making social media marketing (SMM) an important tool in developing customer relationships (Lee et al., 2018). Moreover, social media has become an important digital marketing tool for businesses to promote their products and services and provide personalized communication with customers (Farook & Abeysekara, 2016). Various social media platforms, including social networking websites, microblogs, Twitter, Facebook, Instagram and YouTube, are widely used by firms to promote their products.

Role of Social Media in Businesses

Unlike traditional marketing tools such as television, SMM enables firms to track and gather information related to sales and customer reactions, including preferences and levels of satisfaction. By analysing these data, businesses can refine their marketing strategies and improve resource efficiency (Liu et al., 2021). Another relevant aspect is customer relationship management. However, social media companies can interact directly with their customers, identify target segments and foster interaction. Use of SMM can contribute to building customer trust and customer loyalty (Hollebeek, 2019). In addition, motivating consumers is a crucial part of the purchasing process. Despite consumers being aware of the product and willing to purchase it, the final purchase may not always occur. Thus, business organizations need to implement targeted social media strategies, such as influencer marketing and live-streaming, to strengthen the purchase intentions of consumers (Clement et al., 2021).

Customer Engagement and Social Media

Customer engagement refers to the emotional, behavioural and psychological connection between a customer and a brand, shaped through various interactions across touchpoints such as social media, websites, customer service and in-store experiences (Brodie et al., 2011). Loyalty refers to when a consumer purchases a particular product again and again; however, engagement goes beyond it and includes interactive behaviours such as likes, shares and comments. Robust social media strategies are pivotal for fostering brand awareness, cultivating customer trust and encouraging advocacy—all of which are crucial for the sustained creation of value. Nevertheless, engagement initiatives are complicated by factors such as shifting consumer preferences, alterations in platform algorithms and difficulties in accurately assessing returns on investment.

The present study investigates how the utilization of SMM can enhance customer engagement by focusing on identifying marketing strategies and their outcomes that contribute to long-term relationships in the digital environment. Utilizing social media platforms enables organizations to interact with potential customers in

real-time and run personalized advertising campaigns. According to Karjaluoto et al. (2023), these digital platforms provide businesses with a unique opportunity to communicate on a personal level with customers, which enhances both brand recognition and consumer trust. Likewise, Filieri et al. (2023) also highlighted that the contribution of social media allows businesses to gather meaningful insights into the preferences of their consumers, ultimately leading to increased satisfaction and customer loyalty. While several bibliometric studies have addressed customer engagement (So et al., 2021; Srivastava & Sivaramakrishnan, 2022) and in digital marketing (Faruk et al., 2021; Figueiredo et al., 2025; Krishen et al., 2021). However, fewer have focused explicitly on digital marketing and online customer engagement (Kaur et al., 2023). There is limited comprehensive research addressing this intersection. Although bibliometric studies in marketing have previously explored broader research trends (e.g., Donthu et al., 2021; Kumar et al., 2019), there is limited focus on how SMM and customer engagement have evolved within specific sectors such as retail (Srivastava & Sivaramakrishnan, 2022). This study builds upon these benchmark bibliometric analyses by narrowing the scope to explore the convergence of SMM and customer engagement in the digital retail context. This study aims to explore these gaps through a bibliometric analysis.

The retail sector has been selected as the focus of this study, because it is highly dependent on social media for consumer engagement, loyalty-building and sales generation. This choice is supported by existing literature. For example, Anjorin et al. (2024) present a detailed review of the influence of SMM on retail consumer behaviour; Bianchi and Andrews (2018) demonstrate that engagement through social media platforms can directly affect purchase intentions; and Ahmed (2022) explores how emotional connections, such as 'store love', can be developed through SMM in the grocery retail sector.

Research Questions

1. What is the trajectory of scholarly work in the domain of digital marketing?
2. Which countries and institutions are emerging leaders in SMM research?
3. To identify dominant research themes within high-impact journals in the field of SMM and customer engagement.

Research Methodology

Search Strategy Inclusion and Exclusion Criteria

Database: Scopus	Documents
Search keywords: (TITLE-ABS-KEY ['Social media marketing' OR 'influencer marketing' OR 'Digital marketing'] AND TITLE-ABS-KEY ['customer engagement'])	401
Year: 2016–2024	323
Subject area: Business, management and accounting	203
Document type: Article	124
Language: English	124

The procedure for conducting this study is as follows. Phase 1 involves extracting papers from Scopus on 'Digital marketing and customer engagement' over a 10-year period, from 2016 to 2024. Phase 2 focuses on the data cleaning procedure adopted to remove duplicate and incomplete data. In Phase 3, bibliometric analysis will be performed. In Phase 1, keywords were used to obtain appropriate results from the database, with Boolean operations applied to retrieve the data. The authors shortlisted journal articles, with the scope of the study limited to the subject area of business, management and accounting. The language of the selected articles was limited to English only. This process resulted in the extraction of 124 papers for final analysis.

The research methodology for this research comprises three distinct phases. Phase 1 involves the extraction of relevant research articles from the Scopus database, focusing on the topic 'Digital marketing and customer engagement' over 10 years, from 2016 to 2024. In Phase 2, a systematic data cleaning process is undertaken to eliminate duplicate and incomplete records. Phase 3 entails conducting a comprehensive bibliometric analysis.

During Phase 1, a combination of relevant keywords and Boolean operators was employed to ensure the retrieval of appropriate results from the database. The selection was restricted to journal articles within the subject areas of business, management and accounting. Furthermore, only articles published in the English language were considered. This process yielded a final dataset of 124 articles for analysis.

Figure 1 demonstrates a steady and consistent increase in publications from 2016 to 2024, indicating growing academic and research interest in the field of SMM. The total number of publications has increased from 2 in 2016 to a peak of 47 in 2024, showing an approximately 8-fold growth over the period.

In Figure 2, the horizontal bar graph illustrates the number of documents published by various authors. With nearly three published documents, N. M. Sang is identified as the leading author. The remaining researchers, each contributing two documents, include S. Z. Ahmad, M. S. Balaji, J. Eelen, A. W. Eigenraam, Á. Garrido-Morgado, Ó. González-Benito, L. D. Hollebeek, T. Islam and F. Jashari-Mani.

In terms of distribution, apart from N. M. Sang, who stands out with a comparatively higher number of publications, there is no significant variation among the other authors.

The documents by country/territory shown in Figure 3 depict the distribution of documents published by researchers from different nations or territories using a horizontal bar graph. Leading countries include the United States, with 25 published documents, followed by India in second place, with a slightly lower number of documents. The United States and India emerged as the most productive countries in terms of contribution to research on SMM and customer engagement in retail between 2016 and 2024, likely due to their well-funded academic institutions and strong industry–academia linkages (Dwivedi et al., 2023). India's rapid rise reflects its expanding digital infrastructure and emphasis on research output in global journals (Dwivedi et al., 2023). A holistic review of consumer engagement in social media brand communities highlights how researchers have explored

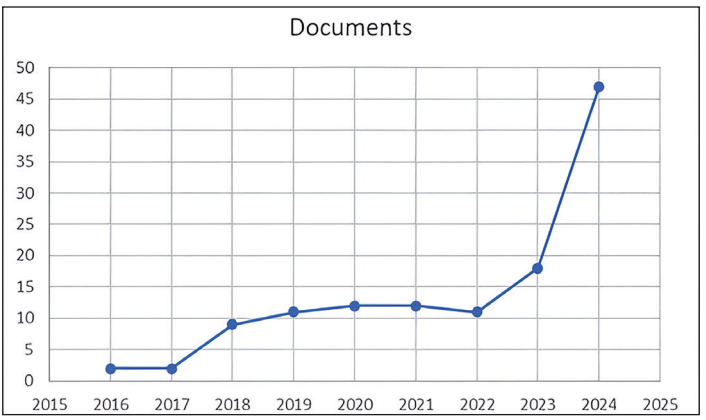

Figure 1. Annual Scientific Production on SMM and Customer Engagement in Retail (2016–2024).

Source: Author's creation based on data retrieved from Scopus.

Notes: The figure shows a notable increase in annual scientific production related to SMM and customer engagement in the retail sector between 2016 and 2024. After a period of gradual growth from 2017 to 2022, the number of publications nearly doubled in 2023 and surged significantly in 2024. This sharp rise suggests a growing academic interest and relevance of the topic in recent years, possibly driven by the digital transformation of retail and post-pandemic shifts in consumer behaviour.

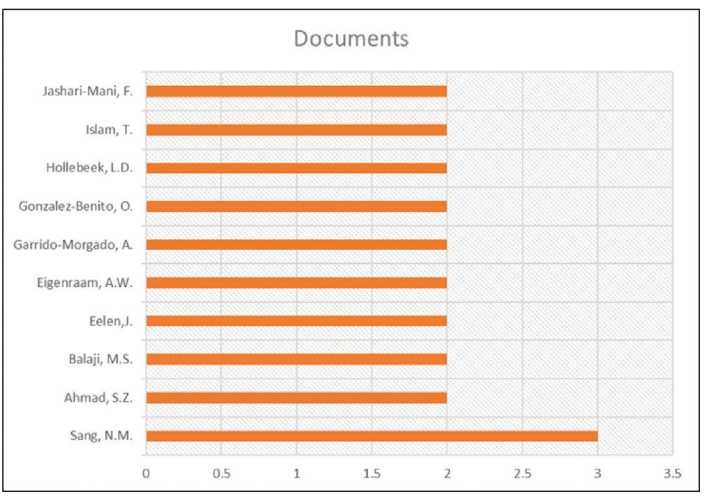

Figure 2. Top Contributing Authors in SMM and Customer Engagement Research (2016–2024).

Notes: The figure displays the top authors based on the number of publications related to SMM and customer engagement in the retail sector. Among the leading contributors, N. M. Sang stands out with the highest number of publications (over 3). In contrast, others, such as S. Z. Ahmad, M. S. Balaji, and L. D. Hollebeek, have made notable contributions with two publications each. This indicates a relatively distributed authorship landscape, with a small number of scholars emerging as key influencers in this research area.

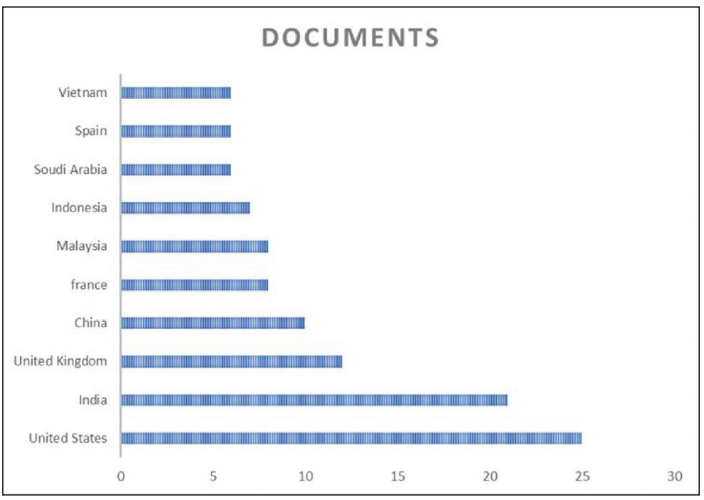

Figure 3. Top Contributing Countries in SMM and Customer Engagement Publications (2016–2024).

Source: Author's compilation based on bibliometric data.

Notes: The figure illustrates the geographic distribution of scholarly output on SMM and customer engagement in retail. The United States leads the field with the highest number of publications (approximately 25), followed by India and the United Kingdom. Emerging contributions are also evident from China, Malaysia and France, indicating growing global interest. The presence of countries from Asia, the Middle East and Europe suggests that this research area is gaining traction across both developed and developing economies, reflecting the global relevance of digital retail strategies.

attitudinal, behavioural and motivational dimensions across 134 empirical studies (Santos et al., 2022). These findings emphasize that nations with well-developed digital ecosystems and supportive research frameworks, such as the United States and India, tend to dominate publication output in this domain. Third place goes to the United Kingdom, which contributed over 12 documents. Contributors in the moderate range—Malaysia, France and China—each submitted between eight and ten documents. Low contributors, with slightly fewer documents, were Vietnam, Saudi Arabia, Indonesia and Spain.

As shown in Table 1, the *Journal of Research in Interactive Marketing* (TC: 1,771 | TP: 30 | H-index: 59) has the highest number of publications (30) among the listed journals, showing its significant contribution to research output. Its H-index (59) and high TC (1,771) indicate that the journal balances both quality and quantity, contributing substantially to the field of interactive marketing. The next source name is *Cogent Business and Management* (TC: 276 | TP: 27 | H-index: 44). This journal also demonstrates steady research output with 27 publications, though its citation impact is moderate. The H-index of 44 suggests it plays a key role in disseminating business management research, particularly for emerging and applied studies.

Table 1. Top Journals Publishing Research on SMM and Customer Engagement (2016–2024).

TC	Source	TP	H-index
1,771	*Journal of Research in Interactive Marketing*	30	59
1,749	*Journal of Business Research*	17	265
1,206	*Journal of Interactive Marketing*	7	126
581	*Psychology and Marketing*	8	143
347	*Journal of Retailing and Consumer Services*	9	143
276	*Cogent Business and Management*	27	44
205	*Marketing Intelligence and Planning*	6	84
39	*Springer Proceedings in Business and Economics*	19	20
32	*International Journal of Internet Marketing and Advertising*	7	25
21	*Journal of Digital and Social Media Marketing*	13	6

Source: Author's compilation based on bibliometric data.

Notes: The table highlights the leading journals in terms of total publications (TP), total citations (TC), and H-index on the topic of SMM and customer engagement. The *Journal of Research in Interactive Marketing* ranks highest with 30 publications and 1,771 citations, indicating its central role in this research domain. *Journal of Business Research* follows in terms of citation impact and H-index, suggesting a strong academic influence despite fewer publications. Specialized journals like *Cogent Business and Management* and *Journal of Digital and Social Media Marketing* show notable contributions, reflecting a diverse publication base that spans both high-impact and niche outlets.

Dominant Themes in High-impact Journals

We conducted a co-occurrence analysis of author keywords using VOSviewer. Both network and overlay visualizations were generated to enhance thematic interpretation. To ensure the focus remained on high-impact research, only journals ranked in Q1 and Q2 were included in the analysis (Figure 4).

The network visualization revealed the following five distinct thematic clusters:

- Cluster 1: Artificial intelligence, loyalty, content marketing, Facebook and social media marketing, indicating a focus on technology-driven engagement strategies.
- Cluster 2: Digital marketing, engagement and social media, reflecting core strategic areas in the field.
- Cluster 3: Purchase satisfaction and purchase intention, emphasizing post-engagement behavioural outcomes.
- Cluster 4: Loyalty and trust, suggesting relational dimensions of customer engagement.
- Cluster 5: Customer engagement and value creation, representing central concepts in SMM retail research.

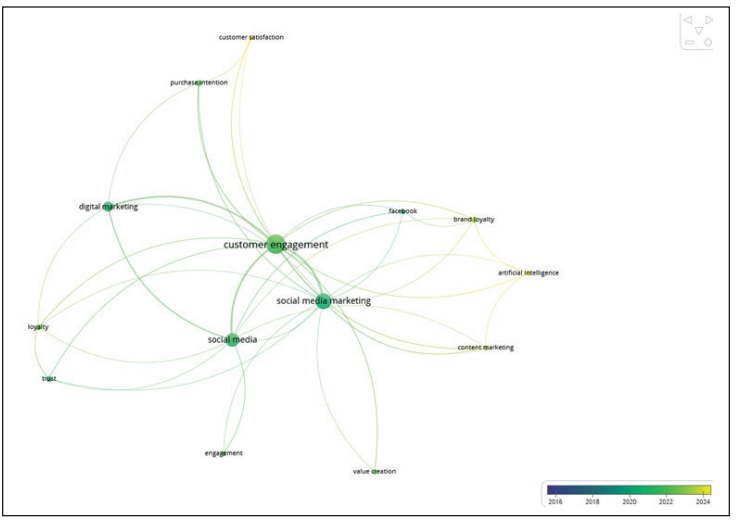

Figure 4. Keyword Co-occurrence Network in SMM and Customer Engagement Research (2016–2024).

Source: Created using VOSviewer.

Notes: This network visualization illustrates the co-occurrence patterns of keywords used in publications related to SMM and customer engagement from 2016 to 2024. The most prominent clusters revolve around customer engagement, SMM and social media, indicating their centrality to the research theme. Emerging terms such as artificial intelligence, brand loyalty and content marketing—highlighted towards the yellow spectrum of the timeline—suggest growing recent interest. Connections with concepts such as trust, loyalty, digital marketing and purchase intention reflect recurring themes in user-brand interaction studies. The timeline colour gradient shows how research priorities have evolved, with newer themes gaining traction in recent years.

The overlay visualization further revealed that recent years (2022–2024) have seen growing emphasis on themes such as artificial intelligence, content marketing and value creation, signalling a shift towards data-driven personalization and customer-centric strategies in SMM.

Table 2 shows that Lee et al.'s paper (2018) is the most cited paper with 674 citations and 112 CPY, followed by Li's paper (2021), which has quickly gained influence with 369 citations and the highest CPY of 123. Other notable works include Liu et al. (2021) and Wang and KIm (2017), both showing a strong academic impact through their focus on luxury branding, big data and firm performance. Papers by Behera et al. (2020), Clement et al. (2021) and Hollebeek (2019) indicate growing interest in personalized marketing, live-streaming platforms and engagement frameworks. The studies collectively explore diverse themes such as advertising content, customer engagement, B2B versus B2C models, and user-generated content. High CPY values in recent works suggest an increasing scholarly focus on data-driven strategies and platform-based Engagement, reflecting current trends in digital marketing research.

Table 2. Highly Cited Publications on SMM and Customer Engagement.

Authors	Documents	TC	CPY
Li (2021)	Social media marketing strategy: Definition, conceptualization, taxonomy, validation and future agenda	369	123
Behera et al. (2020)	Personalized digital marketing recommender engine	121	30
Liu et al. (2021)	Examining the impact of luxury brands' social media marketing on customer engagement: Using big data analytics and natural language processing	322	107
Clement et al. (2021)	Customer engagement and purchase intention in live-streaming digital marketing platforms	127	42
Hollebeek (2019)	Developing business customer engagement through social media engagement platforms: An integrative S-D logic/RBV-informed model	156	31
Wang and Kim (2017)	Can social media marketing improve customer relationship capabilities and firm performance? Dynamic capability perspective	326	47
Eigenraam (2018)	A consumer-based taxonomy of digital customer engagement practices	149	25
Lee et al. (2018)	Advertising content and consumer engagement on social media: Evidence from Facebook	674	112
Yang et al. (2019)	Understanding user-generated content and customer engagement on Facebook business pages	164	33
Iankova et al. (2019)	A comparison of social media marketing between B2B, B2C and mixed business models	228	46

Source: Author's compilation based on bibliometric data.

Notes: The most cited work is by Lee et al. (2018), emphasizing Facebook-based engagement strategies, followed by Li (2021), which offers a strategic framework for SMM. High citation per year rates for recent publications such as Liu et al. (2021) and Clement et al. (2021) highlight increasing scholarly interest in AI, personalization and live-streaming platforms. These publications reflect the thematic and methodological evolution of the field.

TC: Total citation; CPY: citations per year, highlighting influential contributions to the field based on bibliometric indicators.

Conclusion

This study highlights the evolving landscape of SMM and its vital role in shaping customer engagement. In conclusion, the bibliometric analysis clearly shows that scholarly interest in SMM and customer engagement within the retail sector has accelerated from 2016 to 2024, with substantial growth post-2022. This increase

likely stems from widespread digital transformation driven by the pandemic, alongside greater adoption of AI and analytics in marketing strategies (Dwivedi et al., 2021; Kumar et al., 2019). The United States and India lead in research output, reflecting their large digital markets, robust infrastructure and strategic focus on digitalization (Chatterjee & Kumar, 2020). Prestigious outlets such as the *Journal of Research in Interactive Marketing* and *Journal of Business Research* further underscore the depth and influence of this research domain. Thematic keyword analysis reveals a shift from traditional engagement themes like trust and satisfaction towards emerging topics such as personalization, AI-driven value co-creation and content marketing—indicating a move towards more customer-centric and technologically informed practices (Liu et al., 2021). Foundational frameworks and platform-specific engagement models by Lee et al. (2018) and Li (2021) highlight the growing practical relevance of research in this area. Together, these trends show a globally expanding field with increasing conceptual sophistication, pointing to opportunities in AI ethics, cultural adaptation and personalized digital engagement strategies for future studies.

Theoretical Contribution

While bibliometric analyses are inherently quantitative, interpreting the results through conceptual lenses provides a richer understanding of how knowledge in the field has evolved. For instance, the identified clusters on influencer engagement and brand trust align with the behavioural and emotional dimensions described in customer engagement model. Similarly, the presence of terms like 'co-creation' and 'advocacy' supports Brodie et al.'s (2011) view of engagement as a value-creating, relational process. By linking these patterns back to theory, the study not only maps the structure of SMM research but also illustrates how the field conceptually engages with consumer behaviour over time.

Practical Implication

- *Influencer strategies are dominant*: Brands must prioritize partnerships with micro and macro-influencers to foster trust and expand reach.
- *Encouraging community interaction*: Investing in branded online communities can drive co-creation and long-term engagement.
- *Tech-driven engagement is emerging*: Marketing teams should explore AI-based tools to monitor customer sentiment and personalize interactions.

Future Recommendations

Future research can explore emerging areas such as the integration of artificial intelligence in SMM, influencer analytics and the growing relevance of social commerce, aligning with the rapid evolution of digital engagement practices. Additionally, examining platform-specific strategies, for instance, the use of

TikTok for short-form content, LinkedIn for professional branding or Instagram for visual storytelling, can yield more nuanced perspectives on channel-based engagement effectiveness. Scholars should also consider positioning their work in high-impact journals focused on digital and interactive marketing to maximize visibility and academic contribution. Methodologically, longitudinal research designs and bibliometric analyses may be considered in future investigations to track how themes in SMM and customer engagement evolve. Co-word analysis can further be employed to uncover hidden or emerging topic clusters, providing a forward-looking map of research directions and helping scholars identify novel intersections in this growing, shifting domain.

Limitations

The study relies solely on the Scopus database, and the paper lacks inclusion of key studies relevant to the topic indexed elsewhere, like Web of Science. Also, the paper does not incorporate any relevant conference proceedings and grey literature. The search was limited to English-language publications and the business, management and accounting subject area, potentially introducing language and disciplinary bias.

Declaration of Conflicting Interests

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Article

Impact of Dividend Announcement on Share Price: Empirical Evidence from the National Stock Exchange

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Abstract

The dividend policy is essential to all parties connected to the business. Although it is believed that dividend payments impact the market share prices, there is another belief that they deplete corporate reserves and may result in a liquidity crisis for business initiatives. This study aims to investigate the price response to dividend announcements made by 182 companies listed on the National Stock Exchange between 2010 and 2022. The average of the share prices prior to and following the dividend announcement was derived for this purpose. The effect of dividend announcements on share prices has been investigated using the paired *t* test. The findings indicate that in the majority of the industries, dividend announcements had no statistically significant effect on share prices. The investigation reveals important findings regarding investor expectations for dividends and market behavior.

Keywords

Dividend announcements, share price, National Stock Exchange (NSE)

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Introduction

A number of factors, such as the size of the distribution, the company's financial performance, and the state of the market, can affect how exactly a dividend

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announcement affects a company's share price. A corporation is generally in good financial standing when it announces a dividend payment, indicating that it has additional cash flow to provide to its shareholders. Investors may see this as a sign of strength since it means the business is making money and can pay out dividends to shareholders. Investors may receive a signal from a dividend payment that the business is adhering to sound corporate governance principles (Pani, 2008). As a result, anticipation of the dividend payment may cause the share price to increase. Investors may, however, see a company's announcement of a lower-than-expected dividend payment or no dividend payment at all as a bad indication. This could cause the share price to drop since it indicates that the business is either not making as much money as anticipated or holding onto its cash rather than giving it to shareholders. A dividend announcement is arguably among the most important elements of an organization's financial policies because dividends are a key indicator of its solvency, financial soundness, management effectiveness, and overall progress (Raja et al., 2015). Declaring dividends is seen by many businesses as a wise move because it enhances their stock price and reputation. According to Modigliani and Miller (1961), investors are unconcerned about the dividend's size in a perfect market because it has minimal bearing on the firm's valuation (Gupta et al., 2012). The purpose of this study is to investigate the relationship between dividend announcements and changes in share prices that follow. Therefore, it would be fascinating to see how the announcement of a dividend affects the share prices of huge firms.

Literature Review

Ali and Waheed (2017) made an attempt to research how share price volatility is affected by dividend policy. The top 10 companies listed on the Pakistan Stock Exchange were examined for this purpose. According to the study, companies that distributed dividends to their shareholders on a regular basis had more stable stock prices. Narzary and Biswal (2021) also found a positive impact of dividend declaration on the stock return of 80 BSE-listed companies. Hunjra et al. (2014) attempted to examine how the dividend payout ratio affected Pakistani stock prices and discovered that it had a favorable effect. Iqbal (2014) attempted to investigate how dividends affected the pricing of shares of firms in the KSE 30 index between 2002 and 2012. The share price was chosen as the control variable, along with price–earnings ratio, dividend yield, dividend payout, profitability ratio, and return on equity. The study found a favorable effect of every variable on the prices of the shares of the chosen companies, except price–earnings ratio and dividend yield. Kandpal and Kavidayal (2015) examined how the dividend policies of 30 chosen Indian banks listed on BSE affected the wealth of their shareholders and found a major effect of it on the price of shares. Khalid and Shawawreh (2014) investigated the connection between dividend policy and share price volatility of companies listed on the Jordanian stock exchange that represent four industries (banking, insurance, services, and industrial) and found a negative correlation between them. Mutiara et al. (2024) analyzed 81 firms that satisfied the 2017–2021 high dividend index criteria

in an attempt to investigate the impact of dividend policy on company value. The study discovered that dividend policies increased the value of the company. Narzary and Sharif (2015) examined how the dividend policy affected the stock prices of KSE-100 index-listed 45 nonfinancial companies that paid dividends for 12 years starting in 2001 and found a positive correlation between them. Zakaria et al. (2012) examined how the dividend policy affected the share price volatility of 77 construction and material companies listed between 2005 and 2009 on the Bursa Malaysia stock exchange in Kuala Lumpur. The study discovered that a company's size has a major impact on share price volatility.

Research Methodology

This study looks at how dividend announcements affect the share prices of companies that are listed on the national stock exchange. A final sample of 182 companies that pay a regular dividend has been chosen from the population of Nifty 500 companies. The study's 13-year timeframe was from 2010 to 2022. The data have been subsequently categorized into 11 sectors based on the industry's characteristics. The share prices have been averaged for the day and the day after the dividend announcement. The paired *t* test was used to examine the data that were gathered from the PROWESS database, the NSE website, and the companies' annual reports.

Analysis of Data with the Help of "t Test"

This test is employed when the samples are dependent, meaning that either two samples have been matched or "paired" or only one sample has been analyzed twice (repeated measurements). The paired "*t* test" is used to determine how dividends affect share prices. Here, data of share price both before and after the dividend was declared has been gathered and tabulated to enable precise computations and the use of the "*t* test." The paired *t* test equation is as follows:

$$\text{Test statistic: } t = \frac{\bar{D}}{(SD)/\sqrt{n}},$$

where $\bar{D}$ is the mean of difference, *SD* is the standard deviation of differences, and *n* is the number of matched pairs.

In which:

$$SD = \frac{\sqrt{\Sigma D^2 - (\bar{D})^2 .n}}{n-1},$$

Level of significance: 5%.

$n - 1$ = degree of freedom.

Decision rule: H_0 is deemed significant and accepted if the computed value of "*t*" is smaller than the tabulated value.

Hypothesis

H_0: There is no significant difference between the average share prices of the chosen companies before and after they announce dividends.

H_1: There is a significant difference between the average share prices of the chosen companies before and after they announce dividends.

Data Analysis and Interpretation

The results of the paired *t* test, to determine the effect of the dividend announcement on share prices, are shown in Table 1.

The average share price before and after the dividend announcement, the number of companies in a given industry (*n*), the degree of freedom (*df*), the standard deviation, the computed value (t_C), the table value of *T* (t_T), and the test's *p* value are all included in the table. The average share price in Sector 1 (industrial manufacturing), which consists of 22 companies, was 1,388.394 prior to the dividend announcement; following the announcement, it rose to 1398.141. At 21 degrees of freedom (n–1), according to the results, there was an insignificant rise in share prices following the dividend announcement. Since the computed value of *t* (–1.7842) is less than the tabulated value (±2.080) with a *p* value of .088; hence, H_0 is accepted. This shows that the average share prices of chosen firms before and after they announced dividends did not differ significantly. Regarding sectors 2, 3, 4, 5, 8, 9, and 11, comparable findings were obtained. The computed value of "*t*" is lower than the tabular value in each of these sectors. H_0 is deemed to be acceptable in each of these sectors since the *p* value is greater than the 5% level of significance. The findings showed that the relationship between dividend changes and future profitability does not align with the signaling hypothesis's expectations. However, the average share price of Sector 6, which consists of 17 companies, was 182.108 prior to the dividend announcement and rose to 187.146 following the announcement of the dividend. At 16 degrees of freedom ($n - 1$), the results indicate a large increase in share prices following the dividend announcement. H_0 is rejected since the computed value of *t* (–3.170) is more than the tabulated value (±2.120) with a *p* value of .005. This indicates that the average share prices of chosen firms before and after they announced dividends in this specific industry fluctuate significantly. Sectors 7 and 10 show comparable outcomes. The computed value of "*t*" in these sectors is likewise greater than the tabular value. This suggests that H_0 is rejected in both sectors since the *p* value is below the 5% level of significance. This shows that the average share prices of chosen firms before and after they announced dividends differed significantly. The results of the studies by Kaluarachchi (2019), Shukla (2011), Bhatia (2015), and Kaviben (2017) are comparable to these findings.

Table 1. Paired Sample *t* Test.

No.	Sector	Average of Share Prices Before Declaring Dividend (₹)	Average of Share Prices After Declaring Dividend (₹)	*n*	*df* (n−1)	*SD* (Before Declaring Dividend)	*SD* (After Declaring Dividend)	t_C	t_T	*p* Value
1.	Industrial manufacturing	1,388.394	1,398.141	22	21	3,256.233	3,266.727	−1.784	±2.080	.088
2.	Automobile	6,603.484	6,500.599	11	10	12,325.267	12,378.008	0.909	±2.228	.384
3.	Chemical and fertilizers	463.516	463.713	14	13	693.051	692.043	−.250	±2.160	.806
4.	Construction and cement products	656.537	657.172	18	17	880.434	881.665	−1.017	±2.110	.323
5.	Consumer goods	760.620	803.821	32	31	1,413.476	1,414.312	−1.131	±2.040	.266
6.	Energy	182.108	187.146	17	16	158.643	159.048	−3.170	±2.120	.005
7.	Financial service	675.582	718.297	22	21	718.297	581.664	−4.197	±2.080	.000
8.	IT and telecom	722.930	735.451	12	11	652.566	653.635	−1.522	±2.201	.156
9.	Pharma	754.710	756.420	13	12	1,146.654	1,150.903	1.273	±2.179	.227
10.	Media entertainment and services	524.301	570.622	10	9	1,094.799	1,123.111	−2.846	±2.262	.019
11.	Others	124.617	162.295	11	10	57.046	110.766	1.025	±2.228	.329

Conclusion

The dividend policy is an important policy for shareholders. Finding the effect of dividend announcements on the share price of the chosen NSE-listed firms between 2010 and 2022 constitutes the focus of this investigation. According to the study, the share prices of chosen companies in the following sectors—industrial manufacturing, automobiles, chemicals and fertilizers, construction and cement products, consumer goods, IT and telecom, pharmaceuticals, and others—showed little volatility or unusual changes before and after the dividend announcement date. Because the dividend announcement has little effect on the share prices of all of these industries, the average prices of the shares do not significantly rise or fall. Simultaneously, the analysis discovered that the average share prices in just three sectors—energy, financial services, and media entertainment and services—rose significantly following the dividend announcement. Therefore, it is reasonable to state that after dividends are announced, the share prices of these three industries tend to increase. For managers, investors, lenders, and other stakeholders, the study's findings are significant and helpful. It is significant to investors because they perceive dividends as a means of evaluating companies from an investing perspective, in addition to as a source of income. The management must use the findings to create a dividend policy that optimizes shareholder wealth.

Limitations

- Secondary data served as the study's foundation. The results may be affected by the inherent limitations of such data.
- The study's findings are restricted to the specified time frame. As a result, care must be taken when comparing it to other comparable studies.

Declaration of Conflicting Interests

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Article

Digital Transformation of the Hospitality Sector in Rajasthan: A Literature Review

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Abstract

Digital transformation has become a pivotal driver of change in the hospitality industry, especially in culturally rich and tourist-centric regions like Rajasthan. By examining the current landscape, this study aims to provide insights into how digitalization is reshaping the hospitality industry in Rajasthan. This article explores the current status, potential opportunities, and prevailing challenges associated with the digital transformation of the hospitality sector in Rajasthan. It delves into the technological trends reshaping service delivery, customer engagement, and operational efficiency. The research further identifies the gaps in infrastructure, digital literacy, and policy frameworks that inhibit the seamless adoption of digital practices. It examines how the adoption of digital marketing and data analytics further enables targeted service offerings and strategic decision-making. Through a review of literature analysis, the study provides insights into how Rajasthan's hospitality sector can leverage digital innovation to remain competitive while preserving its rich cultural heritage. The methodology used is a systematic review of literature with a sample size of 16 papers, which aims to synthesize existing academic literature to identify and analyze key trends, opportunities, and challenges shaping the hospitality industry in Rajasthan.

Keywords

Digital transformation, customer engagement, operational efficiency

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Introduction

A popular tourist destination in India, Rajasthan is known as the 'land of kings' and is well known for its magnificent forts, lavish palaces, lively festivals, and rich cultural legacy. From the sand dunes of the Thar Desert to the bustling bazaars of Jaipur and the serene lakes of Udaipur, Rajasthan offers a unique blend of historical grandeur and traditional hospitality. With its substantial contributions to infrastructure development, job creation and heritage preservation, Rajasthan's tourism sector is vital to the state's economy. Rajasthan is not an exception to the way that the world's tourist industry has been changing recently due to its shift toward digital technology. The integration of digital tools and platforms into the tourism and hospitality sectors has transformed how tourists plan, experience, and share their journeys. From online bookings and digital payments to virtual tours and AI-powered customer service, digitalization is enabling a more seamless and personalized travel experience. Furthermore, government initiatives such as Digital India and the Rajasthan Tourism Policy 2020 have encouraged the adoption of smart tourism practices, especially in urban centers like Jaipur, Udaipur and Jodhpur. Over the past decade, the hospitality industry in the state has witnessed several evolving trends influenced by globalization, technological advancement, customer preferences, and policy interventions. Rajasthan's tourism ranking has gone up from the eleventh position to the seventh position on national and international scales in 2023, all thanks to the government's tourism policies (Mehta & Joshi, 2024).

Despite these advancements, the adoption of digital technologies in Rajasthan's tourism sector remains uneven. While luxury hotels and urban establishments have embraced digital solutions, many rural and heritage properties face challenges related to infrastructure, digital literacy, and financial constraints. As the industry evolves, there is a pressing need to explore how digital transformation can be harnessed more inclusively and effectively across the state. This article seeks to analyze how digitalization and tourism interact in Rajasthan, stressing both the advantages and disadvantages of this change. It seeks to provide insights into how digital innovation can enhance service delivery, boost competitiveness, and preserve the state's cultural heritage while ensuring sustainable and inclusive tourism development.

Although existing literature acknowledges the increasing influence of digital technology in tourism globally and in India, there is a notable lack of region-specific, empirical research examining how this transformation unfolds across diverse geographies and socioeconomic contexts within a single state like Rajasthan. Most studies to date focus on the broader benefits of digitalization or success stories in urban settings, overlooking the disparities in adoption between urban and rural tourism operators, and between large-scale businesses and small or heritage property owners. Furthermore, there is limited research on how digital technologies can be tailored to preserve cultural heritage while supporting sustainable and inclusive tourism development. This study addresses this gap by exploring the nuanced interaction between digitalization and tourism in Rajasthan, identifying barriers to widespread adoption, and offering strategies for inclusive digital transformation that align with both economic goals and heritage conservation imperatives.

Methodology

This study adopts a qualitative secondary research approach, relying on the analysis of existing literature, industry reports, government publications, and credible online sources to explore the digital transformation of the hospitality sector in Rajasthan. This study aims to evaluate the digital transformation in Rajasthan's hospitality sector using a review of literature approach. Studies were selected based on relevance, quality, and novelty. The inclusion criteria for selecting articles in the literature review were carefully defined to ensure relevance and quality. Studies published between 2013 and 2024 were considered to capture recent and up-to-date findings. Only articles written in English were included to maintain consistency and clarity in understanding. The review focused on peer-reviewed journal articles and systematic reviews to ensure the credibility and scholarly value of the sources. The selected studies involved relevant populations and articles that specifically discussed digital tools, practices, and impacts in hospitality or tourism sectors relevant to India or similar developing regions. Terms like technologies like AI, cloud computing, IoT, CRM, PMS, digital marketing are used. Searches for relevant literature and data were conducted across multiple reputable academic databases to ensure comprehensive coverage. Scopus, Web of Science, Google Scholar, and JSTOR were among the search engines used.

Studies were excluded from the review that focused on sectors other than hospitality or if they did not explicitly address aspects of digital transformation. Additionally, studies published before 2013, those not written in English, and sources that were not peer-reviewed, such as editorials, opinion pieces, or news articles, were not considered.

Objectives

- To critically assess the trajectory and patterns of digital adoption within the hospitality sector in Rajasthan.
- To examine the opportunities emerging from digital transformation and to systematically analyze the key challenges hindering effective digital implementation.

Review Process

A total of 97 articles were initially retrieved. After screening for duplicates, relevance, and quality, 16 studies were included in the final review (Figure 1).

Findings and Suggestions

Recent literature underscores the growing significance of digital technologies in shaping marketing strategies, consumer engagement and operational efficiency within India's hospitality and tourism sectors (Table 1). Digital tools such as GDS, PMS, CRS, and DMS have revolutionized planning, management, and service delivery (Bhatt, 2013), while advanced technologies such as AI, big data,

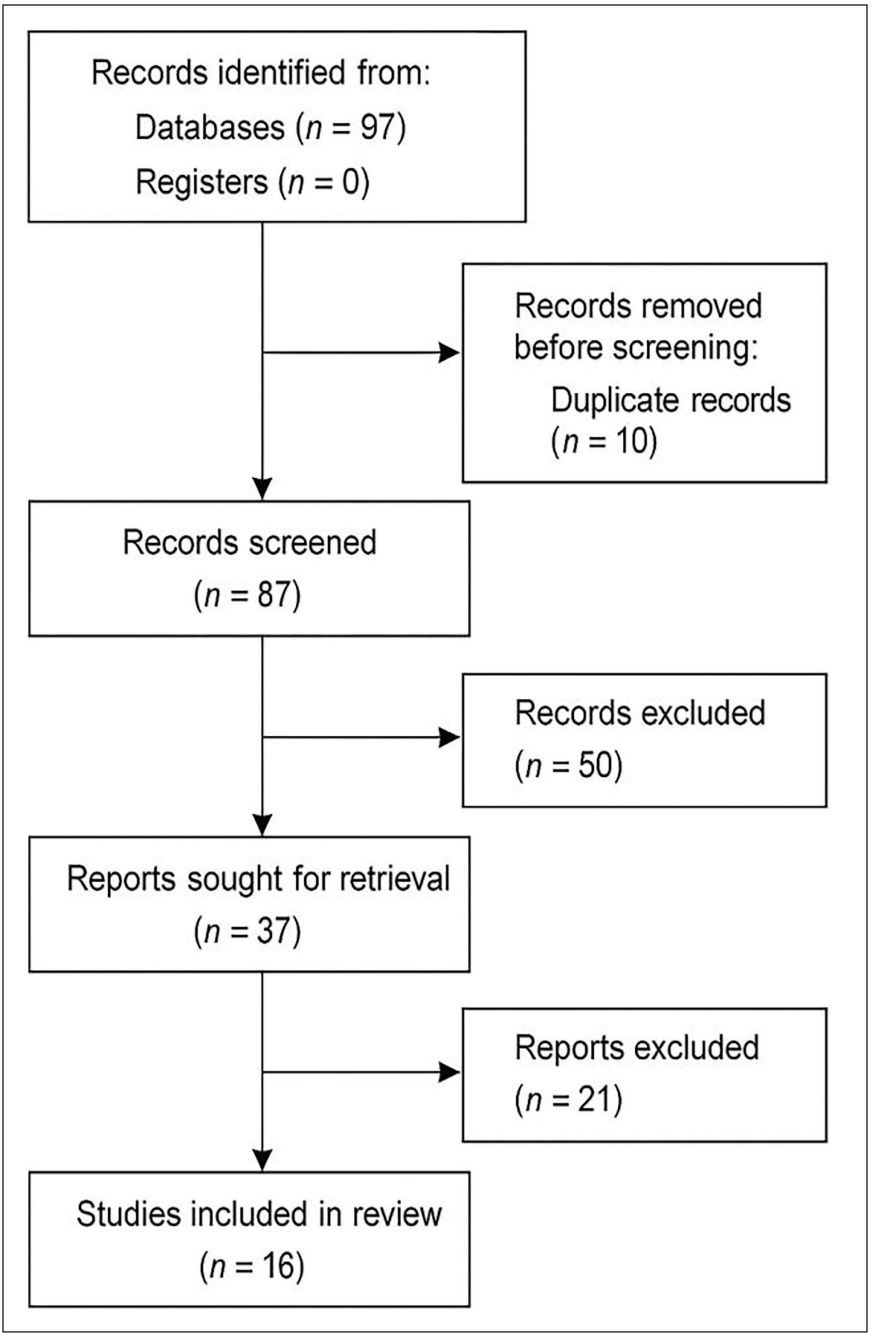

Figure 1. PRISMA Flow Diagram.

Table 1. Digitalization in the Hospitality Industry Literature Review.

Author	Year	Theme	Key Findings	Methodology
Anjana Singh and S. Munjal	2021	Hospitality and tourism industry in the digital era	– The significance of digital technology in marketing. – Influencers and internet reviews' effects on consumer choices. – Current digital trends in industry.	– Analysis of influencers and online reviews. – Gathering perspectives from industry leaders, digital agencies, restaurant owners, and tech consumers.
Lalit Mohan Bhatt	2013	Impact of artificial intelligence and chatbots	– IT and communication technology's importance to industry development. – Planning, managing, and marketing services are done by ICT like GDS, CRS, PMS, and DMS.	– The research methodology used in this research paper is qualitative and exploratory, specifically using a descriptive research approach.
A. Verhun	2022	The shift toward a digitalized economy	– There is a trend toward self-booking and travel arrangements through online agencies. – The online travel market is growing, with e-commerce sites. – Cloud computing, big data, block chain and travel apps are being widely used in the industry.	– Qualitative design – Content analysis of hospitality and tourism industry company websites. – Statistical analysis of digitalization indicators
Rashmeet Kapoor and Kushagra Kapoor	2021	Challenges faced in the transition to digital marketing	– E-marketing tools are adopted in five-star hotels in India. – Scope and challenges of artificial intelligence in the Indian hospitality industry. – How digitalization has benefited the industry compared to traditional marketing methods.	– Qualitative approach – Data collection through one-on-one telephonic interviews (some in questionnaire format) – Round-table conference with general managers and marketing communication managers of 30 New Delhi/NCR hotels

(Table 1 continued)

(Table 1 continued)

Author	Year	Theme	Key Findings	Methodology
Jyoti Jhajhra	2024	Trends in the hospitality sector	– Industry is inclined toward digital transformations due to growing digital demand and ubiquitous connectivity. – Digital transformation and customer-centric approaches are impacting the marketing environment. – Technology is the most pertinent trend in the hospitality sector.	– The study appears to use a descriptive or exploratory methodology. – This study is based on qualitative evaluations of literature. – The study reviewed articles published in various hospitality research journals.
Pawan Kumar, Shivani Dubey, and Ajay Kumar Sahu	2022	Artificial intelligence and automation in operations	– The travel industry is significantly impacted by digital innovations such as AI, big data, mobile apps, social media and VR/AR. – Growing trend toward digital platforms for travel planning and booking, with high usage of online websites, voice search, and mobile devices.	– The paper is a review article, which involves a comprehensive analysis of existing literature on digital tourism in India, focusing on economic impact, trends, and technological roles.
Garima Mishra	2024	Social media and influencerdriven brand building	– Social media significantly influence tourists' perceptions and travel decisions in Rajasthan. – The strategic use of social media has revolutionized Rajasthan's tourism.	– Personal observations and secondary data collection from reputable sources such as books, government reports, articles, and periodicals. – A comprehensive search through online sources and social websites.

(Table 1 continued)

(Table 1 continued)

Author	Year	Theme	Key Findings	Methodology
E. Nikolskaya	2021	The impact of digital technologies	– The hospitality business is information-dense and needs cutting-edge digital technologies for its advancement. – Digital technologies are essential for integration, communication, service quality and information transfer. – The implementation of digital systems offers opportunities for resource saving and efficiency improvements.	– Logical, inductive, deductive, analytical, synthesis, and systematization techniques. – Use of statistical data from state bodies and legislative documents. – Incorporation of results from scientific research.
Prakash Meena and Bathini Lokesh	2024	Technology for HR transformation	– Opportunities and technical barriers for HR change in historic hotels, with technology being a key component in overcoming these obstacles. – Relationship between technology adoption and organizational performance. – The ANOVA test shows differences in technology platform usage among hotels, with notable returns on investment such as cost savings and increased productivity.	– Descriptive research methodology – Primary data collection: surveys, interviews, and focus groups with HR professionals, employees, and technology providers – Secondary data: literature reviews and industry publications. – Quantitative data analysis: Microsoft Excel, Google Sheets, and one-way ANOVA test.
Prof. Subodh Kumar and Ashutosh Sharma	2024	Prospects and future developments in the digital economy.	– The impact of recent technological advancements on the travel and hospitality industries. – Digitalization has significantly enhanced operational efficiency and personalized guest experiences. – New opportunities for growth and innovation in the industry.	– The methodology involves a descriptive analysis. – The study likely uses a literature review approach to explore these effects.

(Table 1 continued)

(Table 1 continued)

Author	Year	Theme	Key Findings	Methodology
S. Munjal and Anjana Singh	2021	Adoption of emerging technologies.	– The significance of the digital push in data analytics and marketing. – Technology must be used promptly in the hospitality sector. – Digital marketing is becoming a critical element of marketing.	– To determine how the Indian hospitality and tourism industry has responded to digitization, the process entails analyzing and summarizing previous research findings.
Dr. Anukrati Sharma and Om Prakash Rishi	2018	E-marketing and e-commerce	– Tourism businesses in the Hadoti region lacked a strong digital presence, limiting their visibility to potential tourists. – E-marketing tools such as social media, SEO, and email marketing are used less. – Significant gap in e-commerce integration, with few enterprises offering online booking or payment options. – A noticeable gap exists in digital literacy and awareness among stakeholders.	– Exploratory research design is used in this research.
Dr. Singu Prasanth	2024	Difficulties in making the switch to digital marketing	– Technological innovations are significantly impacting the hospitality sector, particularly in areas like smart hotels, AR/VR experiences, and AI-powered customization. – The study highlights both the advantages and challenges of technological advancement.	– The study employed an integrated literature review technique, analyzing previous and current studies. – Sources included lectures, conference proceedings, internet publications, journals and books. – Analytical, synthesis, critical thinking, and generalization techniques were used.

(Table 1 continued)

(Table 1 continued)

Author	Year	Theme	Key Findings	Methodology
Deborah RoseShylla Passah and Ashok Kumar	2019	Digital payment systems and contactless services	– The tourism sector in India is rapidly growing and contributes to India's GDP, ranking seventh globally. – The study explores the digitalization process and its impact on promoting cashless tourism practices. – Challenges faced by small and medium tourism enterprises and tourists.	– The study is an explorative study that reviews the process of digitalization and innovation in digital payment systems to promote cashless tourism practices in India.
Ozgur Ozdemir, Tarik Dogru, Murat Kizildag, Ezgi Erkmen	2023	Future outlook: embracing smart tourism	– Digitalization in the hospitality industry is still in its infancy in terms of adoption and value creation. – Stakeholders stand to benefit from opportunities from existing and emerging digitalization applications.	– The study is a conceptual, critical reflection paper involving the authors' assessment and reflection on current digitalization efforts in the hospitality and tourism industry.
A. Tanwar	2022	New job roles and skills in the digital tourism era	– Rural tourism patterns and trends in the Shekhawati region. – From the standpoint of rural tourism, the study aims to advance the enhancement of Shekhawati as a travel destination. – Social impact of rural tourism on the local culture.	– A random sampling technique is used to collect the sample from respondents. – Primary data were collected from respondents by surveys, questionnaires, and interview methods.

cloud computing, and block chain are enabling personalized experiences and enhanced decision-making (Kumar & Sharma, 2024; Verhun, 2022). A consistent theme is the transition from traditional to digital marketing, particularly in luxury hotels, with increased adoption of e-marketing, social media, and influencer-based strategies to influence tourist behavior (Kapoor & Kapoor, 2021; Mishra, 2024). Digitalization also plays a vital role in improving internal operations, from HR functions in heritage hotels to guest satisfaction through mobile apps, automated systems, and integrated digital platforms (Meena & Lokesh, 2024; Singh & Munjal, 2021). Studies highlight its potential to boost customer retention, productivity, and global competitiveness (Munjal & Singh, 2021; Ozdemir et al., 2023). However, digital adoption is uneven across regions. Areas like Hadoti face infrastructural and awareness challenges (Sharma & Rishi, 2017), while rural tourism regions such as Shekhawati show untapped potential for digital-led cultural and employment growth (Tanwar, 2022). The need for training, financial literacy, and infrastructure remains critical, particularly for SMEs and rural stakeholders (Passah & Kumar, 2019; Prasanth, 2024).

To address these issues, it is recommended that the Rajasthan tourism and hospitality ecosystem prioritize targeted government support in the form of subsidies and digital transformation grants for SMEs. Enhancing digital infrastructure in rural areas through public–private partnerships is critical. Parallel to this, digital literacy and skills training for hospitality staff should be expanded through local academic institutions and tourism boards. Organizations can use a digital maturity model as a framework to evaluate their present state of digital transformation or maturity. It offers a methodical way to assess how successfully a company has incorporated digital technology into its procedures, values, and plans. Businesses may use the approach to prioritize projects, find gaps, and develop a digital progress plan. Heritage hotels should be guided to adopt hybrid service models that balance technology with personalized hospitality, preserving cultural authenticity while improving efficiency. Cybersecurity awareness and data protection protocols must be promoted through state-level guidelines, and affordable security solutions should be made accessible to small businesses. Overall, a regionally adaptive, equity-driven approach to digital transformation is essential to ensure Rajasthan's hospitality industry thrives sustainably in the digital age.

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Article

Role of Organic Farming in Enhancing Sustainable Agricultural Development: A Review of Indian Trends and Policy Implications

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Abstract

As global awareness of environmental issues increases, the importance of organic farming as a sustainable method of agriculture has also increased. It has gained significant attention as a viable alternative to conventional farming. This study examines previous research to assess how organic farming contributes to promoting sustainability. It also highlights the environmental, economic and social benefits, identifies barriers to adoption and proposes recommendations. The data related to organic farming and sustainable agricultural development were collected from various journals, periodicals, national programme of organic production, the Agricultural and Processed Food Products Export Development Authority and the International Federation of Organic Farming Movements (IFOAM). The study revealed that the dependence on conventional farming has led to severe challenges, including soil degradation, water scarcity, greenhouse gas emissions and declining biodiversity. These impacts threaten the sustainability of agricultural systems and the livelihoods of millions of farmers. Therefore, organic farming is the need of the hour for achieving the goal of sustainable agriculture development.

Keywords

Agriculture, organic farming, sustainable development

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Introduction

The issue of sustainable agriculture development has received worldwide attention. Sustainability stands for the successful management of resources without harming the environment and society. Sustainable agriculture development is a set of various types of farming activities that maintain agricultural productivity, efficiency and profitability in the long run without affecting the natural resources and environment. The adoption of local skills, least dependence on external inputs, crop rotation, etc., are the basic requirements for agricultural sustainability.

Sustainable agriculture means meeting the food and other related demands of society by using sustainable methods. It ensures that development must meet not only the requirements of the present without compromising the future requirements (Kher & Bhagat, 2003). Chemicals fertilizers and plant protection materials have been damaging the environment and the whole agriculture sector (Joshi, 2001). Sustainable agriculture is the successful management of natural resources along with manpower for agricultural development by sustaining or improving the quality of these resources (Sangwan, 2005). It is necessary to promote the economic viability of the Indian farmers. Sustainable agriculture development includes systems that maintain productivity, profitability and efficiency in the long term without affecting the environment and society.

Organic farming is practised in almost all countries. Globally, both the area under organic farming and the number of organic farmers are steadily increasing. Organic farming is a crop production method that respects the rules of nature. Commitment to nature protection is a prerequisite for practising organic farming. Organic farming contributes to the socio-economic and ecological sustainable development. Sustainable agriculture has the capacity for providing food to the people for a long time. The use of chemical fertilizers and pesticides increases the cost of cultivation. Continuous uses of these inputs cause adverse effects on the fertility of the soil and a decline in the farm produce. The unsustainable agricultural practices can adversely affect the farmers' health and their long-term income (Asokan & Murugan, 2018). So, there is a need to raise awareness among the farmers that organic farming practice can sustain Indian agriculture.

Organic farming is a safe and sustainable farming system which produces healthy and nutritious food without harming the environment and the productivity of the soil. It avoids the use of chemical fertilizers and pesticides. But, there is a common understanding that a large-scale conversion to organic farming would result in a reduction in the aggregate crop production. Organic farming is also criticized on the ground that organic inputs alone could not improve farm productivity and profitability. There is a debate on organic farming, such as can, through organic farming, we produce food for the continuously increasing population. Is food produced through organic farming qualitatively and superior from conventional farming? Is organic farming economically viable?

India has huge potential in the area of organic farming because of favourable agro-climatic conditions, cheap labour, use of traditional resources and farming practices and wide export market potential. Organic farming has been superior to inorganic farming because of factors such as lower cost of cultivation, higher

profits and less environmental degradation. The small and marginal farmers left out during the green revolution have good scope to improve food security for the country without using synthetic chemicals. After independence, producing adequate food for a growing population was one of the most important challenges for India. Hence, high-yielding varieties of seeds, chemical fertilizers and pesticides were used to increase agricultural production. But continuous usage of these chemical fertilizers and plant protection materials has resulted in adverse effects on human beings and the environment. To overcome the problem arising due to chemical fertilizers and pesticides-based farming, the use of organic farming has become essential for achieving sustainable agriculture.

Review of Literature

There is a vast literature available on organic farming and sustainable agriculture development in India as well as abroad. Some of the important and relevant studies have been reviewed here to support the conceptual framework and research methodology. Sahani et al. (2020) emphasize that organic farming does not mean shifting to traditional techniques of farming, but it includes sustainable means of agriculture and modern farming techniques of agriculture. It has been superior to inorganic farming because of lower cost of cultivation, higher market profits and less environmental degradation. This study suggested that India has great potential for organic farming, and organic products are commercially viable in India. Asokan and Murugan (2018) observed that organic farming practice is being adopted in India, and farmers are aware that it can sustain the agriculture sector. Such farming also improves the quality of life of the people by providing safe food and better health. It can contribute to the meaningful socio-economic and ecological development of a country. Hammas and Ahlem (2017) have conducted a study on organic farming: a path of sustainable development. The main objectives of the study were to theoretically and empirically test the three pillars of sustainability, that is, the development of society, the environment and the economy. The study observed that there was a positive impact on economic growth and the environment of organic farming.

Soumya (2015) examined the scope and importance of organic farming as an important and effective way to promote sustainable farming systems in our country. Sarkar (2015) observes that the main objective of organic farming is to create an integrated, humanitarian and sustainable production system. Organic farming promotes the use of renewable energy and local farm-based resources. It is also helpful in maintaining soil fertility and meeting food security. Yadav et al. (2013) conducted a study on organic farming for sustainable agriculture. They concluded that only the organic farming system has the capacity to produce quality food without causing any adverse effects on the health of soils and the environment. It is suggested that there is a need to identify suitable crops with international market demand. Uma et al. (2013) conducted a study on the cropping pattern and its impact on food security. They concluded that the youth of rural areas are getting attracted towards urban areas, and they are neglecting agricultural activities. The

study revealed that the changing cropping pattern has posed a threat to the production of food crops and food security in the future. Sudheer (2013) revealed that the increasing demand for food grains and fear of food security in India led to the increasing use of chemical fertilizers and pesticides. But the long-term use of chemical fertilizer leads to a reduction in crop yields and deterioration of soil fertility. Therefore, sustainable agriculture can be the best alternative to avoid the adverse effects on the environment. Dima and Odero (1997), in their study on organic farming for sustainable agricultural production, observed that modern agricultural production is not sustainable due to the high cost of chemical inputs. The study concluded that organic farming promotes sustainable agriculture, and it is cheaper than the application of chemical fertilizers.

Organic Farming in India: An Overview

India cultivates a diverse variety of crops, and while agriculture contributes around 15% to the GDP, it remains the main livelihood source for most of the rural population. Two-thirds of its population is engaged in agricultural activities. Due to the rapid population growth and expansion of industrial growth, the availability of land for agriculture is declining in India. With an average landholding size of just 1.1 hectares and a continuing downward trend, there are growing concerns about the food and livelihood security of millions (Pandey & Ranganathan, 2018).

In 2001, India started the National Programme for Organic Production (NPOP) to promote organic farming. It is adopted for the implementation of organic production in the country. NPOP lays guidelines for the production and exports of organic farming and deals with the accreditation and certification of bodies. The PGS-India programme was also launched for the local and domestic market to support farmer group-centred certification. Both programmes support organic farming. According to the World of Organic Agriculture Report 2018, India ranks first in the number of organic farms and ninth in area-wise. It produces about 30% of the total organic product in the world. Sikkim became the first fully organic state in India. The Ministry of Agriculture, Government of India, is promoting organic farming under the National Project on Organic Farming, National Horticulture Mission and Rashtriya Krishi Vikas Yojana. The area under organic farming in India has increased manifold in recent years.

Table 1 provides data on the area under organic farming systems in India, focusing on the years 2011–2012 to 2020–2021. It depicts information related to the area under cultivation, the number of farmers and total production under organic farming. The area under organic farming under NPOP fluctuated significantly over the years. It started at 5,550,405 hectares in 2011–2012 and decreased to 3,566,538 hectares in 2017–2018, followed by a slight recovery to 4,339,185 hectares in 2020–2021. The area certified under PGS-India was 6,064.14 hectares in 2013–2014. It was 222,369.55 hectares in 2019–2020. The NPOP system reported no data in the initial years. The number of farmers increased in 2020–2021, with 1,599,010 farmers under organic farming. Under PGS-India, the number of farmers was

Table 1. Area under Organic Farming System in India, 2011–2012 to 2020–2021.

		Area Under Organic Cultivation		Number of farmers		Organic Production (MT)	
Sl No.	Year	NPOP	PGS-India	NPOP	PGS-India	NPOP	PGS-India
1	2011–2012	5,550,405	0		0		0
2	2012–2013	5,211,141	0		0		0
3	2013–2014	4,719,816	6,064.14		5,809		23,612.42
4	2014–2015	5,690,000	9,249.39		11,118		1,079*
5	2015–2016	5,710,384	19,281.91		19,355		6,321,660.53
6	2016–2017	4,452,987	96,291.60		173,846		8,760,810.96
7	2017–2018	3,566,538	6,455.29		84,618		17,132,676.09
8	2018–2019	3,428,639	124,989.90		166,571		989,255.06
9	2019–2020	3,669,801	222,369.55		365,253		2,047,535.90
10	2020–2021	4,339,185	7,568.30	1,599,010	12,074	3,496,800.34	3,399,520.21

Source: PGS-India Portal.

Note: *As per year-wise certificate data available at PGS-India Portal.

consistently lower in 2013–2014. The highest farmer participation was in 2019–2020, with 365,253 farmers, but it dropped to 12,074 in 2020–2021. Organic production under NPOP felt wide fluctuations, starting from no data initially and reaching 17,132,676.09 MT in 2017–2018 before stabilizing at 3,496,800.34 MT in 2020–2021. Production data under PGS-India began in 2013–2014, with 6,064.14 MT, and showed variations; it was 8,760,810.96 MT in 2016–2017 and then decreased over the subsequent years to 3,399,520.21 MT in 2020–2021.

In India, during 2021–2022, about 1,618,464.46 hectares were certified as organic, contributing significantly to sustainable agricultural practices. An area of 3,108,250.27 hectares was under the conversion process, showing a strong trend towards transitioning to organic farming. The combined total area under organic and conversion farming was 4,726,714.74 hectares, reflecting the significant scale of organic agriculture adoption in these states (Government of India, Ministry of Agriculture and Farmers Welfare, 2022). Table 2 presents data on the top 10 states in India with the highest cultivated farm area under organic farming during the year 2021–2022. Madhya Pradesh shows the highest total cultivated area at 1,504,950.14 hectares, including the largest organic area and a significant conversion area. Maharashtra ranks second with 1,133,570.30 hectares. Sikkim, despite being a fully organic state, shows a relatively smaller total area (75,475.28 ha), as it has already achieved full organic status. Jharkhand has a negligible organic area (10.4 ha) but a considerable conversion area (58,859.74 ha), highlighting its transitional phase.

Table 3 provides data on organic and conversion production across various agricultural categories for the year 2021–2022. Fibre leads significantly with 1,440,603.39 MT, contributing nearly half of the total organic production. Other notable categories include oil seeds (464,818.47 MT), sugar (336,883.17 MT),

Table 2. States with the Highest Cultivated Farm Area for the Year 2021–2022.

Sl No.	State	Organic Area (in ha)	Conversion Area (in ha)	Total area (in ha)
1	Madhya Pradesh	618,080.48	886,869.66	1,504,950.14
2	Maharashtra	224,787.36	908,782.94	1,133,570.30
3	Gujarat	81,700.72	520,547.77	602,248.50
4	Rajasthan	204,871.08	284,033.68	488,904.77
5	Odisha	72,757.78	107,664.51	180,422.29
6	Karnataka	58,613.37	37,575.51	96,188.88
7	Uttarakhand	31,739.17	57,931.71	89,670.88
8	Sikkim	75,168.33	306.95	75,475.28
9	Uttar Pradesh	53,700.93	17,245.72	70,946.65
10	Jharkhand	10.40	58,859.74	58,870.14

Source: Govt of India, Department of Agriculture and Farmers Welfare (2022).

Table 3. Category-wise Production of Organic Commodities During Year 2021–2022.

Sl No.	Category	Organic Production (in MT)	Conversion Production (in MT)
1	Cereals and millets	242,416.93	534.826
2	Coffee	20,070.62	0
3	Dry fruits	14,459.13	9.386
4	Fibre	1,440,603.39	444,786.94
5	Flowers	7,329.65	0
6	Fodder	7,895.84	7,895.84
7	Fresh fruits and vegetables	85,548.01	6.40
8	Medicinal plant products	101,179.90	13.50
9	Miscellaneous	2	0
10	Oil seeds	464,818.47	13,349.11
11	Others	10,263.66	500
12	Processed food	6,268.73	0
13	Pulses	73,765.37	24.084
14	Spices and condiments	95,087.20	0
15	Sugar	336,883.17	50
16	Tea	42,844.94	0
17	Tuber products	1,483.78	0
Total		2,950,920.785	459,274.239

and cereals and millets (242,416.93 MT). Coffee, flowers, spices and condiments, tea, tuber products and processed food have production exclusively under the organic category, indicating these are well established in organic farming. The data reflect India's diversified approach to organic agriculture, with significant contributions from cereals, pulses and medicinal plants.

Organic Farming as a Driver of Sustainable Agricultural Development

Organic farming contributes towards the ecological and socio-economic development of a country. It encourages the use of local knowledge, local seeds and local-level manure. It is one of the important methods used to meet the aim of sustainable agricultural development in India. Sustainable agriculture is the practice of agriculture, which is based on the principles of safeguarding ecology and concentrates on the ability to provide food for the future (Asokan & Murugan, 2018). This type of agricultural activity conserves soil and water resources, improves agro-diversity, protects our climate, provides safe food and safeguards our livelihood. To ensure the farmer's viability as well as the protection of the environment, it is necessary to promote sustainable agriculture in India. It will also improve farm productivity, efficiency and long-run profitability.

As a driver of sustainability, organic farming addresses critical challenges like soil degradation, water pollution and loss of biodiversity. By prioritizing ecological integrity and resilience, organic farming supports long-term agricultural productivity without compromising natural resources. Economically, it offers farmers better market opportunities and income stability. Socially, it promotes healthier food systems and strengthens rural livelihoods. By balancing productivity with ecological conservation, organic farming provides a sustainable pathway to food security and environmental resilience.

Organic farming plays a pivotal role in promoting sustainable agricultural development by fostering environmental, economic and social sustainability. This cropping system relies on fertilizers that are safe and non-hazardous to crops. In India, where various crops are grown, it has become evident from various studies that modern agriculture needs to shift towards sustainable practices. Organic farming aims at maintaining an optimal nutrient balance and promoting the biological health of the soil. This approach is more beneficial for farmers and can create more job opportunities. By adopting organic farming, farmers can reduce the use of external inputs, while consumers gain access to healthier food. It also enhances soil productivity. As people become more aware of the advantages of organic food, they are more likely to pay a premium for eco-friendly products. Consequently, low-external-input agriculture can be particularly appealing to small-scale farmers in India.

Sustainable agriculture focuses on achieving an optimal nutrient balance and supporting the soil's biological health. This method of agriculture is more advantageous for farmers and can generate additional employment opportunities. By using organic farming, farmers can minimize the use of external inputs, allowing

consumers to enjoy healthier food. It also improves soil productivity. As awareness of the benefits of organic food increases, consumers are more inclined to pay higher prices for environmentally friendly products. Therefore, organic farming methods offer a sustainable alternative. They integrate traditional knowledge and scientific innovations to create resilient agricultural systems. It depends on ecosystem management rather than external methods for increasing agricultural production. It does not need a costly investment on farmland. Organic farming protects the environment and the community by excluding chemical fertilizers and pesticides. It requires less financial input and places more dependence on the natural and human resources available.

The main objective of organic farming is to maximize human welfare without any harm to the environment. The success of organic farming depends on the awareness of the health problems caused by the use of chemical fertilizers. Organic products carry high prices in the market as compared to inorganic products, which makes organic farmers more profitable. Organic farming can also contribute towards food security, the improvement of agricultural productivity, and the reduction of rural poverty by providing more employment (Soumya, 2015). Organic farming lays more importance on the use of local resources, which contributes towards the development of the rural community as well as farmers.

To overcome the losses in terms of environment, biodiversity, economic and social elements, farmers need to adopt organic farming at a large scale (Sikka et al., 2005). Despite the growing demand for organic products, organic farmers face several challenges, such as low crop prices, high certification costs, significant investments in resources during the conversion period, price fluctuations and marketing difficulties. The conversion to organic agriculture has been a slow process because it involves low farm yields and high-risk involvement. Organic farming is an integral component of sustainable agricultural development because it embodies principles and practices that prioritize environmental conservation, economic viability and social equity. By reducing the environmental footprint of agriculture, enhancing soil health, and providing economic opportunities for farmers, organic farming contributes to a more sustainable and resilient food system.

Environmental, Economic and Social Benefits of Organic Farming

The growing demand for organic produce opens new markets, both domestic and international. Organic farming emphasizes practices that minimize environmental impact. It relies significantly on fertilizers that are safe and non-toxic to crops. These practices include avoiding synthetic chemicals, promoting crop rotation, conserving water and maintaining biodiversity. Reducing the dependency on chemical fertilizers and pesticides lowers input costs. Over time, practices such as organic farming yield higher profits due to premium market prices for organic products.

Organic farming offers significant environmental advantages that contribute to sustainable agricultural development. This farming system improves soil structure and fertility through the use of organic matter such as compost, cover crops and animal manure. This leads to increased soil organic carbon levels, enhanced nutrient cycling and reduced soil erosion. Organic farming usually leads to more biodiversity on farms. This is because it avoids using synthetic pesticides and fertilizers, making the environment safer for many types of plants and animals. By not using chemical inputs and adopting methods like crop rotation and growing multiple crops together (polyculture), organic farming helps prevent water pollution. It also improves the soil's ability to hold water, which makes water use more efficient.

Organic farming can positively impact the economic sustainability of agriculture. The demand for organic products is growing globally, allowing farmers to achieve premium prices. This can increase profitability, particularly for smallholder farmers, although organic farming can require higher labour inputs, the reduction in chemical input costs can offset these expenses. Over time, improved soil health can lead to increased productivity and profitability. Organic farming practices can offer greater resilience against market and environmental shocks, such as volatile input prices and climate extremes, due to diversified cropping systems and reduced dependency on external inputs. Such a farming system reduces exposure to synthetic pesticides and fertilizers, potentially leading to healthier food products for consumers and safer working conditions for farmworkers. Organic farming can stimulate rural economies by creating jobs in farming, processing and distribution. It often supports small-scale and family-run farms, promoting rural community stability (IFOAM, 2020). Organic farming often involves community-based practices and knowledge exchange, fostering a culture of sustainability and increasing awareness of environmental and health issues (Gomiero et al., 2011).

Organic Farming Leads to Food Security

Agriculture is the backbone of rural economies worldwide. Achieving food security for all has been the central issue of India's agricultural policy since independence. Food security not only includes food but also nutritional security. It can be analysed through food availability, economic access, absorption and stability in food systems. It is the function of agriculture that holds together the biophysical and social aspects of production. In order to achieve food security, there is a need to promote ecologically sustainable methods of agriculture. For this purpose, an organic farming system can play an important role. It is the best economic and ecological alternative to avoid food insecurity in the long run. The organic farming system can produce sufficient food of a high quality. This system is also well-suited for hill areas that are currently most exposed to water shortages. This type of farming requires more labour, instead of machinery, and can contribute to local food security in several ways. For ensuring food security, organic farming is very useful because it has the capacity to maintain agricultural productivity, efficiency

and profitability. Organic farming can play a significant role in promoting food security, both at the global and local levels.

Constraints of Organic Farming to its Adoption

Organic farming avoids synthetic pesticides and fertilizers, reducing chemical contamination of soil, water and ecosystems. This protects biodiversity and minimizes harm to non-target species. Despite its benefits, organic farming faces challenges that need to be addressed to fully realize its potential in sustainable development. Organic farming can result in lower yields compared to conventional methods, particularly in the short term. This can be a barrier to its adoption, especially in regions with high food demand. The process of obtaining organic certification can be costly and time-consuming for farmers. Successful organic farming requires specific knowledge and skills.

A lack of technical expertise and awareness about the benefits of eco-friendly practices limits its adoption. Farmers often perceive these methods as risky compared to conventional practices. Organic farmers also face challenges such as limited access to premium markets, inadequate price support and competition with subsidized conventional farming products. Organic farming often uses efficient irrigation methods and practices that help conserve water resources. Organic farming typically produces fewer greenhouse gases per unit of agricultural output compared to conventional farming, mainly due to reduced synthetic fertilizer use. While the transition to organic farming can involve initial costs, over time, farmers often experience reduced input costs as they rely more on organic materials and biological pest control methods.

Conclusion and Recommendations

It may be concluded that excessive use of chemical fertilizers is harming not only agriculture but also the environment as a whole. Organic farming can provide a sustainable pathway to address these challenges faced by agriculture today. Organic farming enhances soil health, conserves natural resources and empowers rural communities, contributing to long-term sustainability. Various studies have shown that organic products are more profitable than inorganic products due to lower costs of production and high market prices of the organic products. Hence, it leads towards sustainable agriculture. Such farming often encourages crop diversification, reducing the risk of crop failure and providing farmers with multiple income streams. Organic farming can also contribute to rural development by creating jobs and fostering local economies. It often encourages small-scale and family farming. Organic products often fetch higher prices in the market due to consumer demand for organic and sustainably produced food.

Farmers should be encouraged towards organic farming, and training should be provided for the preparation of farmyard manure and green manure. If a farming system is adopted according to the local available resources, farming can

become self-dependent and economically viable. Organic farming system promotes sustainable food production that is less reliant on external inputs, making them more resilient in the face of resource constraints.

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Article

Farmers Perceptions and Barriers to Organic Farming Adoption: Evidence from Himachal Pradesh

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Abstract

This study examines farmers' perceptions and the adoption of organic farming in Himachal Pradesh, focusing on factors influencing the shift from inorganic to organic practices. Data were collected from 400 farmers across Kangra and Mandi districts using a structured questionnaire. Statistical tools, including *t* tests and χ^2 tests, were used to analyse socio-economic differences, cost structures, benefit–cost ratios and perception-related factors such as input availability, training, marketing constraints and profitability. Findings reveal that organic farmers are younger, more educated and better trained than inorganic farmers. While inorganic farming offers higher yields in crops such as wheat and paddy, organic farming demonstrates lower input costs and better profitability for crops such as maize and peas. Differences in perception significantly affect adoption decisions. The study emphasises the importance of policy support in farmer training, input accessibility and market infrastructure. These measures can enhance the adoption of organic practices, contributing to sustainable agriculture in hilly regions.

Keywords

Organic farming, perception, adoption

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Introduction

Indian agriculture in the post-independence era has witnessed a dramatic transformation. India suffered from an acute shortage of food grains until the 1960s.

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It primarily depended on foreign food aid through programmes such as Public Law 480 (PL 480), also known as the Agricultural Trade Development and Assistance Act of 1954, to meet its needs. However, the government measures to enhance food security by boosting food production through the implementation of the Green Revolution in the 1960s completely revolutionised agricultural production (Oyesola & Obabire, 2011). The Green Revolution, powered through the use of high-yielding crop varieties, advanced irrigation techniques and modern farming practices, significantly enhanced the productive capacity of Indian agriculture and made India not just self-sufficient but a surplus nation. However, the long-term adverse effects of these modern agricultural practices on the fertility of land, human health, water table, etc., have seriously questioned the sustainability of these agricultural practices. Thus, the popularity of organic farming is growing worldwide because it aligns agricultural production systems with goals such as increased productivity, farm revenue, food quality and environmental sustainability (Uhunamure et al., 2021). It focuses on growing crops and rearing livestock in a way that works in balance with nature, avoiding the use of chemical pesticides and synthetic fertilisers.

The sustainability of current farming practices in India has been questioned recently. Organic farming has become a prominent alternative approach aimed at promoting sustainable agriculture by conserving the environment and safeguarding long-term food security. The state of Himachal Pradesh, with its diverse topography and a limited presence of pollutants, is a highly suitable region for the practice of organic farming. It is located in the northern part of India and has been actively promoting and implementing organic farming techniques to preserve the environment, enhance soil fertility and ensure the production of healthy and chemical-free agricultural products. The Himachal Pradesh government has introduced various measures to support and promote the adoption of organic farming among cultivators. To encourage this shift, it provides financial assistance and subsidies aimed at facilitating the transition to organic agricultural methods. This encompasses support for acquiring organic inputs, such as bio-fertilisers and biopesticides, and the creation of vermicompost units. Training programmes and seminars are also organised to provide farmers with knowledge and understanding of the fundamental concepts and techniques of organic farming. These programmes cover topics such as composting, seed treatment, crop rotation and pest management through natural methods.

The government has also established model farms in several regions of Himachal Pradesh to demonstrate successful organic agricultural practices. These agricultural establishments function as educational hubs for farmers, offering hands-on demonstrations of organic farming techniques. The cultivation of indigenous and traditional crop varieties that are well-suited to the local agro-climatic conditions is prioritised. Periodic awareness campaigns are also implemented to foster awareness among agricultural practitioners and consumers regarding the advantages of adopting organic farming practices and the significance of consuming food free from chemical additives.

Efforts are also being undertaken to establish market linkages for organic produce originating from the state of Himachal Pradesh. To support this, farmers are

incentivised to acquire organic certification for their agricultural products, as it aids in guaranteeing product quality and attaining more favourable prices within the organic market. These steps have facilitated the practice of organic farming in Himachal Pradesh, which is seeing a surge in popularity. However, there is still massive scope for expanding organic farming in the state, and steps need to be taken to facilitate farmers' further adoption of organic farming.

Positive perception of farmers is very important for the adoption of organic farming; the present article aims to uncover the perception of organic farmers regarding seven key dimensions, namely, knowledge and training, availability of inputs, production cost, marketing, profitability, government aid and environmental sustainability. Organic farmers' perception of these key dimensions will help identify the major problems and bottlenecks that might impact the further adoption of organic farming in the state.

Review of Literature

Organic farming practices hold a crucial place in promoting the sustainability of agriculture. However, its adoption by farmers is affected by multiple factors. These factors associated with the adoption of organic farming can be majorly grouped into four main categories, namely demographic characteristics, farm structure, psycho-behavioural factors and supportive factors (Sapbamrer & Thammachai, 2021). The adoption of organic farming is influenced by various demographic characteristics, such as age, gender, education level, marital status, income and the size of the household. The age of the farmer has been negatively associated with the adoption of organic farming (Métouolé Méda et al., 2018; Rana et al., 2012; Singh et al., 2015). Higher levels of education among farmers were observed to have a positive correlation with the adoption of organic farming practices (Azam & Banumathi, 2015; Genius et al., 2006). Female farmers are also reported to exhibit a higher likelihood of adopting organic farming in comparison to male farmers (Azam & Banumathi, 2015; Métouolé Méda et al., 2018). In addition, a greater household size has been positively associated with the likelihood of adopting organic farming methods (Wollni & Andersson, 2014).

The psycho-behavioural factors impacting the adoption of organic farming include the attitude and perception of farmers regarding different facets of organic farming. The positive attitude of organic farmers about its environmental benefits was associated with higher adoption of this practice (Genius et al., 2006; Lapple & Van Rensburg, 2011). Risk-averse farmers were found to exhibit a lower likelihood of adopting the practice of organic farming (Haris et al., 2018; Lapple, 2010). Among the farming factors, farm size is found to be negatively associated with the adoption of organic farming, partly due to high labour requirements (Khaledi et al., 2010; Liu et al., 2019; Mala & Maly, 2013). Technological challenges and the requirement for more labour input by the farmers were found to negatively impact the adoption of organic farming (Schneeberger et al., 2002). Further, lower production costs and higher prices, thus higher profitability, positively impacted the adoption process (Panneerselvam et al., 2012). Problems

related to attacks by pests served as a hindrance in the adoption process (Alotaibi et al., 2021).

Factors facilitating the adoption of organic farming include the presence of effective marketing support (Khaledi et al., 2010), availability of proper training (Karki et al., 2011; Singh et al., 2015), access to proper resources such as adequate water supply (Pinthukas, 2015), and credit facilities (Rana et al., 2012). Further, technological support (Khaledi et al., 2010) and the availability of subsidies (Genius et al., 2006; Mala & Maly, 2013) also increased the adoption process significantly. Thus, raising knowledge, offering training, and expediting the certification procedure may change farmers' perceptions and encourage organic farming practices (Uhunamure et al., 2021).

The reviewed literature highlights the pivotal role of farmers' perceptions in influencing the adoption of organic farming practices. In this context, the present study aims to assess the variations in farmers' perceptions and examine their impact on the adoption of organic farming in Himachal Pradesh.

Materials and Methods

This research relies on primary data gathered from Himachal Pradesh using a structured questionnaire. The sample size was calculated employing the Cochran formula, outlined as follows:

$$n_0 = \frac{Z^2 pq}{e^2},$$

where n_0 is the desired sample size, Z is the z value corresponding to the selected level of precision, p refers to the proportion of the population possessing the attribute in question, $q = 1 - p$, and e refers to the level of precision. Taking a 95% level of confidence and maximum variability exhibited by $p = 0.5$, the sample size was calculated as follows:

$$n_0 = \frac{(1.96)^2 (0.5)(0.5)}{(0.05)^2} = 384.$$

In order to account for non-response errors, a round-off figure of 400 was used for the study. A multistage stratified sampling approach has been used to collect primary data. Out of 12 districts of Himachal Pradesh, two districts were selected, namely Kangra and Mandi districts (see Figure 1). These districts were chosen due to their relatively high concentration of farmers engaged in organic farming practices. Two blocks were selected randomly within these districts. The two blocks from Kangra district were Nagrota Bagwan and Sulah, and Mandi Sadar and Seraj were from Mandi district.

The perception of farmers regarding organic farming practices was assessed across seven major dimensions, namely knowledge and training, availability of inputs, production cost, marketing, profitability, government support and environment and sustainability. The data regarding these perceptions was obtained by

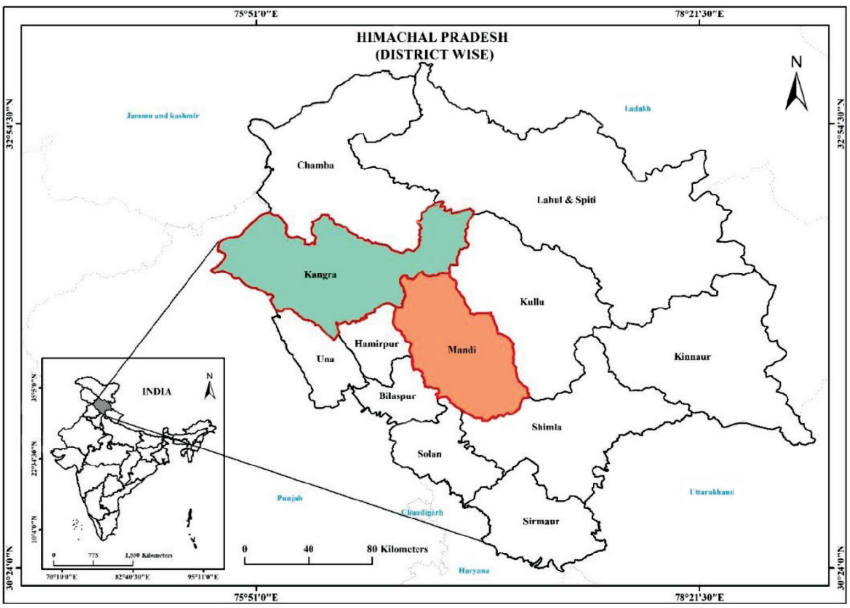

Figure 1. Showing the Location of the Study Area.

administering a Likert scale questionnaire. Since attitude cannot be measured directly, different sets of questions were used to capture the attitudes of farmers about different dimensions. In order to ensure the reliability of this set of questions in capturing different attitudes, the Cronbach αtest was performed. It is estimated using the following formula:

$$\alpha = \frac{N\bar{C}}{\bar{V} + (N-1)\bar{C}},$$

where N denotes the total number of items, $\bar{C}$ represents the mean inter-item covariance, and $\bar{V}$ signifies the average variance of the items. A given set of items/questions is said to be a reliable measure of a variable if the value of Cronbach's α comes out to be 0.70 or above. After ascertaining the reliability, descriptive statistics were employed to present a clear picture of the attitude of farmers.

Further, in order to determine if the difference in perception of organic and inorganic farmers was significant across these key dimensions, the *z*-test of mean difference was used. The test statistic was calculated as follows:

$$z = \frac{\overline{x_1} - \overline{x_2}}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}},$$

where $\overline{x_1}$ and $\overline{x_2}$ refer to the mean of perception for organic and inorganic farmers, respectively, σ_1 and σ_2 refer to the standard deviations of organic and inorganic

farmers across the dimensions, and n_1 and n_2 refer to sample sizes of organic and inorganic farmers.

Results and Discussion

This section presents the results regarding the perception of farmers across the seven dimensions, namely knowledge and training, availability of inputs, risk in production, marketing constraints, profitability, government aid and environment and sustainability. First, the Cronbach α test was administered to ensure that the questions taken up in the study to measure the perception of farmers across these seven dimensions are internally consistent. The results of the same are presented in Table 1.

The questions designed to assess various farmer perceptions regarding organic farming demonstrated internal consistency, as indicated by a Cronbach's αvalue exceeding 0.70. Thus, the questions aimed at measuring the attitude of these dimensions could be considered as reliable estimates of the said attitude.

Table 2 presents the results for the perception of farmers regarding different dimensions related to organic farming procedures and practices. A score of 1 in the questions indicates complete disagreement with the statement/question, while a score of 5 indicates complete agreement. Depending on the nature of the questions, the score thus indicates either a positive or negative perception of farmers regarding different dimensions that impact their decision to adopt organic farming practice

Perception regarding the availability of knowledge and training about any farming practice is critical in fostering its adoption. Farmers are expected to adopt organic farming if they perceive that the information regarding its practice is easily accessible. It helps to reduce uncertainty, aid in developing required skills and provide proper support networks to understand the process and benefits of organic farming. Overall, with a mean score of 3.86, organic farmers reported a better perception of the availability of knowledge and training on organic farming practices in Himachal Pradesh. The inorganic farmers had a less positive perception, with a mean score of 2.93. Significantly higher mean scores across all individual questions reflect this. Thus, a better perception of knowledge and training related

Table 1. Value of Cronbach's α Among Items Across Each Perception.

Perception	Cronbach's α	Number of Questions
Knowledge and training	0.809	5
Availability of inputs	0.825	6
Risk in production	0.814	4
Marketing constraints	0.894	5
Profitability	0.950	7
Government support	0.855	5
Environment and sustainability	0.875	4

Source: Computed from the field survey.

Table 2. Perception of Knowledge and Training among Farmers in Adoption of Organic Farming.

S. No.	Questions	Organic	Inorganic	Difference
1	There is adequate guidance and training.	3.92	2.97	0.95[a] (10.51)
2	There is availability of training at regular intervals.	4.03	2.98	1.05[a] (13.46)
3	You have a good understanding of seed variety, seed rate, seed treatment and time of sowing.	3.83	2.86	0.97[a] (12.90)
4	You have a good understanding of the different types of crops and their suggested dosages.	3.75	2.92	0.83[a] (10.83)
5	You have sufficient knowledge about how to make bio-insecticides.	3.78	2.96	0.82[a] (11.70)
	Mean of all five items	3.86	2.94	0.92[a] (16.42)

Source: Computed from the field survey.

Notes: Figures in the parentheses refer to z-values.

'a' indicate significance at 0.01 and 0.05 levels for a two-tailed z-test.

to organic farming practices seems to be a contributing factor in the adoption of organic farming in the state.

Another major requirement in farming practice is the regular availability of good-quality inputs as presented in Table 3. Any shortage in inputs directly impacts agricultural productivity. In the questions probing the availability of inputs of organic farming, a higher score, above 3, shows positive perception and a lower one exhibits negative perception. Overall, the perception regarding the availability of inputs such as seeds, irrigation facilities, bio-fertilisers and biopesticides was poor among both types of farmers, as indicated by low scores of 2.34 for inorganic farmers and 1.65 for organic, which is less than 3 for both. However, this perception was even worse among the inorganic farmers, as indicated by a significantly lower score of 1.65.

Production-related risks in farming profoundly impact the stability of agricultural production and productivity. It serves as a great disincentive to invest in agriculture and thus impedes its progress. A negative perception regarding production risks associated with organic farming can hinder its adoption among farmers currently practising inorganic methods. In the question about production risk, a higher score indicated a high perception of risk and vice versa (see Table 4). Thus, a higher-than-average score of 3.49 indicates a negative perception of organic farmers about production-related risks.

Both organic and inorganic farmers reported negative perceptions regarding risks associated with organic farming practices, as indicated by the mean scores of 3.49 and 4.09 for both types of farmers. This negative perception was common for the availability of all types of major production risks, like risks related to low

Table 3. Perceptions of Availability of Inputs in Adoption of Organic Farming.

S. No.	Questions	Organic	Inorganic	Difference
1	Good-quality seed	2.53	1.61	0.92[a] (9.80)
2	Proper irrigation facilities	2.05	1.68	0.37[a] (4.56)
3	Labour availability	2.52	1.64	0.88[a] (10.53)
4	Required manures and bio-fertilisers	2.48	1.65	0.83[a] (9.52)
5	Supply agencies are nearby.	2.10	1.64	0.46[a] (5.92)
6	Good availability of Biopesticides	2.34	1.72	0.62[a] (7.11)
	Mean of all six items	2.34	1.66	0.68[a] (10.06)

Source: Computed from the field survey.

Notes: Figures in the parentheses refer to z-values. 'a' indicate significance at 0.01 and 0.05 levels for a two-tailed z-test.

Table 4. Perceptions of Risk in Production Among Farmers in Adoption of Organic Farming.

S. No.	Questions	Organic	Inorganic	Difference
1	There is a risk of low yield.	3.81	4.03	−0.22[b] (−2.54)
2	There is a risk of insect attack.	3.29	4.08	–0.79[a] (−11.03)
3	There is a risk of weeds.	3.33	4.09	−0.76[a] (−9.82)
4	There is a risk of low quality.	3.54	4.17	−0.63[a] (−8.02)
	Mean of All four items	3.49	4.09	−0.60[a] (−10.28)

Source: Computed from the field survey.

Notes: Figures in the parentheses refer to z-values. 'a' and 'b' indicate significance at 0.01 and 0.05 levels for a two-tailed z-test.

yield, insect attack, weeds and low quality. However, inorganic farmers reported significantly higher perceptions of risk and, thus, more negative perceptions in comparison to their organic counterparts.

Marketing agricultural products is critical to ensure agriculture's economic viability. It helps connect the farmers and consumers effectively, thus ensuring an efficient supply chain and maximum benefit for both parties. In the absence of proper marketing facilities, the agricultural producer will not be able to reach the

Table 5. Perceptions of Marketing Constraints Among Farmers in Adoption of Organic Farming.

S. No.	Questions	Organic	Inorganic	Difference
1	Lack of purchasing agencies for organic products	4.03	4.17	−0.14 (−1.63)
2	Dependence on a middleman for disposal	3.94	4.23	−0.29[a] (−4.03)
3	No purchasing agencies in the rural area	3.99	4.15	−0.16[b] (−2.04)
4	A scarcity of marketing information	4.05	4.18	−0.13 (−1.57)
5	The market for organic products is unstable	4.06	4.16	−0.10 (−1.16)
	Mean of all five items	4.01	4.18	−0.17[a] (−2.85)

Source: Computed from the field survey.

Notes: Figures in the parentheses refer to z-values.

'a' and 'b' indicate significance at 0.01 and 0.05 levels for a two-tailed *z*-test.

right consumer and thus will not be able to fetch the right prices for the products. In the question about marketing constraints, a higher score indicated higher marketing constraints and vice versa. Thus, a higher-than-average score of 4.01 indicates a negative perception of organic farmers about marketing facilities.

Overall, organic and inorganic farmers had very high negative perceptions about the availability of marketing facilities for organic produce, which is shown by a mean score of 4.01 for organic and 4.17 for inorganic farmers (see Table 5). Both types of farmers reported a lack of availability of proper purchasing agencies, dependence on middlemen, lack of information about marketing facilities and instability of the market. Although inorganic farmers recorded significantly higher scores than their organic counterparts, this difference was not very wide. Thus, based on findings related to this dimension, it can be concluded that the marketing of organic products is one of the major issues related to organic farming practices.

Profitability is the cornerstone of any economic activity. As long as the farmers do not hold a positive perception of the profitability of their operations in organic farming, the adoption of this farming practice cannot reach its full potential. In the question pertaining to profitability, a higher score indicated a poor perception of profitability in organic farming and vice versa. Again, both organic and inorganic farmers reported negative perceptions, with a mean score of 3.78 and 4.17 regarding the profitability of organic farming practices in Himachal Pradesh as shown in Table 6. There were concerns regarding high production costs, low prices, higher preparatory costs, lack of demand, spoilage, transportation costs and lack of proper packaging facilities. However, inorganic farmers reported significantly higher scores across all the questions and across this dimension, indicating a more negative perception regarding its profitability.

Table 6. Perceptions of Profitability Among Farmers in Adoption of Organic Farming.

S. No.	Questions	Organic	Inorganic	Difference
1	High production cost	4.05	4.30	−0.25[a] (−2.82)
2	Low prices of organic products	3.60	4.19	−0.59[a] (−7.10)
3	The initial set-up costs for organic farming are higher compared to inorganic farming	3.72	4.11	−0.39[a] (−4.77)
4	Lack of high demand for organic products	3.79	4.20	−0.41[a] (−4.44)
5	The danger of spoilage during storage	3.73	4.12	−0.39[a] (−4.29)
6	Transportation costs are very high	3.87	4.16	−0.29[a] (−3.27)
7	Lack of proper gardening and packaging facilities	3.75	4.12	−0.37[a] (−4.53)
	Mean of all seven items	3.79	4.17	−0.38[a] (−5.89)

Source: Computed from the field survey.

Notes: Figures in the parentheses refer to z-values.

'a' indicate significance at 0.01 and 0.05 levels for a two-tailed z-test.

Government facilities play a vital role in promoting the adoption of organic farming practices. Providing extension services and financial incentives helps create a supportive ecosystem for the widespread adoption of organic farming. A higher score in this dimension indicated the availability of government support and, thus, a positive perception. Both organic and inorganic farmers had a strong positive perception, with a mean score of 4.17 and 3.64 regarding this aspect of organic farming (see Table 7). There was a perception of the excellent availability of loan facilities, subsidies, testing facilities, etc., provided by the government. However, again, organic farmers reported significantly higher scores than the inorganic ones, thus indicating better perception across this dimension (see Table 7).

Organic farming is beneficial for environmental stability, as it minimises the ecological impact of agricultural practices. If the farmers have a positive perception regarding the sustainability and benefits of organic farming as opposed to inorganic practices, it might further motivate them to adopt it. Both groups of farmers again reported favourable perceptions of the sustainability of organic farming and environmental benefits, with organic farmers reporting significantly higher scores, with a mean score of 4.23, than their inorganic counterparts, with a mean score of 4 (see Table 8).

Based on the assessment of the perception of organic and inorganic farmers across these seven dimensions, it can be concluded that organic farmers have better perceptions than inorganic ones. However, both groups reported poor perceptions about the availability of inputs, production risk, profitability and marketing facilities available for organic farming in Himachal Pradesh.

Table 7. Perceptions of Government Facilities Among Farmers in Adoption of Organic Farming.

S. No.	Questions	Organic	Inorganic	Difference
1	Availability of loan facilities	4.14	3.71	0.43[a] (4.71)
2	Proper government facilities	4.21	3.60	0.61[a] (7.47)
3	Availability of agriculture officers	4.20	3.36	0.84[a] (12.06)
4	Availability of subsidy	4.11	3.73	0.38[a] (4.97)
5	Sufficient testing facilities (soil, products, etc.)	4.18	3.84	0.34[a] (3.65)
	Mean of all five items	4.17	3.65	0.52[a] (8.57)

Source: Computed from the field survey.

Notes: Figures in the parentheses refer to z-values.

'a' indicate significance at 0.01 and 0.05 levels for a two-tailed z-test.

Table 8. Perceptions of Sustainability Among Farmers in Adoption of Organic Farming.

S. No.	Questions	Organic	Inorganic	Difference
1	Inorganic farming is not sustainable.	4.22	3.86	0.36[a] (4.65)
2	Inorganic farming leads to unhealthy food production.	4.24	4.14	0.10[b] (1.24)
3	Inorganic farming leads to the pollution of water.	4.28	3.93	0.35[a] (4.39)
4	Inorganic farming is associated with exposure to chemicals.	4.18	4.09	0.09 (1.12)
	Mean of all four items	4.23	4.00	0.23[a] (3.64)

Source: Computed from the field survey.

Notes: Figures in the parentheses refer to z-values.

'a' and 'b' indicate significance at 0.01 and 0.05 levels for a two-tailed z-test.

Conclusion and Suggestions

The study found that both organic and inorganic farmers of Himachal Pradesh have a positive perception of the availability of knowledge and training, government support and environmental sustainability associated with the practice of organic farming. However, their perception of the availability of inputs, production cost, marketing and profitability of organic farming was poor. Availability and efficient distribution of good-quality inputs were found to be deficient in the

state. Further, farmers' perceptions of the profitability of organic products were found to be poor. They also reported higher risks associated with organic farming yield, coupled with marketing bottlenecks. These perceptions were notably unfavourable among inorganic farmers in the state and may serve as a barrier to their adoption of organic farming practices.

The following measures are proposed to support the shift towards sustainable farming and encourage the adoption of organic agriculture:

- *Expand access to farmer training and field-level guidance*, especially in bio-input preparation, seed treatment and organic certification processes.
- *Decentralise the distribution of quality organic inputs*, including seeds, bio-fertilisers and biopesticides, to effectively reach remote farming communities.
- *Invest in organic market infrastructure*, such as dedicated procurement centres, certification support, storage and marketing platforms, to reduce middleman dependency.
- *Empower women and engage youth* through targeted schemes and cooperatives, as they are more inclined towards adopting sustainable practices.

These recommendations are essential for policymakers, NGOs, and agricultural planners to strengthen the organic farming ecosystem in hill states such as Himachal Pradesh and support sustainable, inclusive agricultural development.

Declaration of Conflicting Interests

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Article

The Knowledge Blackout: Workplace Incivility, Contract Breaches, and the Light of Ethical Leadership

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Abstract

This study investigates the connection between workplace incivility (WI) and knowledge-hiding behavior (KHB) using knowledge from social learning theory. Drawing on a survey of 388 employees across various Indian organizations, analyzed using partial least squares structural equation modeling (PLS-SEM), the study confirms that WI significantly increases KHB ($\beta = 0.510$, $p < .01$). It also reveals that psychological contract breach (PCB) mediates this relationship (VAF = 0.323), while ethical leadership (EL) plays a buffering role, weakening the adverse impact of WI on KHB. Results demonstrate that WI causes a rise in KHB, since employees facing incivility tend to withhold information exchanges because of work-related stress. PCB also supports the finding because expectations not met by employers or employees can lead to employees hiding important information from them. It was found that EL plays a moderating role, as moral leaders reduce the harmful impact of WI by strengthening fairness, transparency and trust.

Keywords

Social learning theory, toxic work culture, trust and transparency, organizational behavior, knowledge management

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Introduction

With the economy now driven by knowledge, knowledge management (KM) has become very important in organizations, contributing to greater innovation, smarter decisions, and better competitiveness. KM means an organization's plans and efforts to improve how knowledge is used all around the company (Baskerville & Dulipovici, 2006). KM helps place vital information, skills, and understanding in the hands of staff, so that they can team up, resolve issues, and constantly improve their work. If organizations use strong KM tools, they promote learning throughout the organization, lessen the need for repetition, and increase both efficiency and performance (Antunes & Pinheiro, 2020). As a result, organizations now recognize that knowledge is very valuable and that effectively managing it is essential for their success. Yet, despite KM concentrating on making knowledge easily available, organizations tend to face obstacles, and one of the biggest obstacles is knowledge-hiding behavior (KHB). When employees intend to hide or refuse to share valuable knowledge with others, it is called KHB by Bari et al. (2020). This behavior might include: not sharing all the facts, not wanting to talk about vital details, or acting like they have no idea (Van Slyke & Belanger, 2020). KHB stands out because it harms the foundations of KM by preventing information from being shared and hindering teamwork. Knowledge hoarding by employees can harm those who miss out on helpful information and can also harm the company. Reducing workers' ability to share knowledge can slow down innovation (Chin et al., 2024), allow inefficiencies to develop (Bari et al., 2020), and decrease how quickly teams can find solutions to problems (Liu et al., 2020), making it more challenging for the organization to respond effectively (Anand et al., 2020).

KHB often causes problems that relate to work culture and teams, and workplace incivility (WI) is a main driver of these issues (Haar et al., 2022). When people at work display WI, it usually means they act in a disrespectful way that can still drastically harm employee happiness and the company's culture (Andersson & Pearson, 1999). When workers are treated rudely, they may deal with increased stress, reduce their job satisfaction, and lack confidence in their colleagues; thus, they might engage in ways that retaliate or defend themselves, including KHB (Wu et al., 2022). Because of this, staff may avoid helping one another and keep private facts when working with others who do not behave appropriately at work (Yao et al., 2020). As a result, acts of uncivil behavior at work harm organizational culture and negatively affect opportunities for colleagues to share what they know with each other (Xia et al., 2022). Psychological contract breach (PCB) is highly significant among the different causes of KHB. Employees create psychological contracts in their minds about what should be given and received from both sides, such as support for their career, job safety, and fairness. Owing to the breaking of trust, employees start to feel betrayed and unhappy. This usually leads to lower levels of involvement and performs counterproductive work, such as KHB (Ghani et al., 2020). A PCB causes employees to be less likely to offer their efforts and to keep information hidden from others (Liang, 2022). The breach damages their psychological attachment to the

company, which discourages employees from helping each other with knowledge. Based on the structure created in this study, we propose that ethical leadership may moderate the relation between work importance and employees' knowledge and health beliefs. Individuals in the workforce typically feel attracted to leaders with ethical values and a reliable reputation (Wu et al., 2022). The way a leader acts ethically shapes employees' thoughts and behaviors, which then affect their relationships at work. According to studies, when leaders are ethical, employees share knowledge with their peers because they are committed to the organization and influenced by their leaders (Liu et al., 2020; Wu et al., 2022). Though research on KHB in organizations is increasing (Connelly et al., 2019), there is still a lot we do not understand about how it works in India.

Although global research on WI and KHB is robust, limited empirical studies contextualize these constructs within Indian organizational culture. In India, hierarchical workplace structures, collectivist values, and social identity pressures may uniquely influence how incivility is perceived and responded to by employees (Bijalwan et al., 2024; Jain et al., 2022). Existing studies, such as Agarwal et al. (2024) and Anand et al. (2023), have explored knowledge sharing and incivility, but few have examined the mediating role of PCB and the moderating effect of EL in Indian service- and knowledge-based sectors, where interpersonal dynamics are critical. Moreover, emerging Indian scholarship points to a rising prevalence of subtle incivilities in virtual and hybrid workplaces, yet the behavioral consequences like knowledge hiding remain underexplored (Ghani et al., 2020; Hassan et al., 2023). Therefore, this study addresses a specific gap by investigating how WI leads to KHB in Indian organizations, using PCB as a mediator and EL as a moderator, through quantitative analysis of data collected from 388 Indian professionals between July and December 2024. By focusing on the Indian organizational landscape, this study contributes to a culturally nuanced understanding of toxic work dynamics and KM challenges.

People in organizations have discussed knowledge hiding since it often leads to trust issues, poor careers and rivalries, which can make productivity, effectiveness, and growth more difficult depending on the intentions of the knowledge hider (Xiao & Cooke, 2019). Numerous studies have considered how things like organizational culture, a KM system, policies, goal focus, and politics affect knowledge hiding (Kaur & Kang, 2022; Koay et al., 2022). There is still a need to examine more closely what encourages knowledge hiding among employees (Irum et al., 2020). When negative affect is present, people tend to hide their knowledge, so studying which specific emotion leads to this behavior is necessary. The study aims to focus on the different interactions amongst WI, PCB, KHB, and EL. Understanding how these issues are linked helps employers bring about healthier relationships at work. By looking at how people who are mistreated at work hide information and how ethical leaders can prevent these issues, this study offers useful guidance on what supports or gets in the way of information sharing. The results help to guide decisions about improving knowledge sharing and encouraging transparency and teamwork. All in all, the study attempts to answer these research questions:

RQ1. How does WI influence KHB in organizations?
RQ2. What role does PCB play in the relationship between WI and KHB?
RQ3. Can EL moderate the impact of WI on KHB?
RQ4. How does EL foster a culture of knowledge sharing and reduce the incidence of knowledge hiding in the workplace?

Literature Review

WI and KHB

WI disrupts social interactions in organizations and is characterized as low-intensity deviant behavior with ambiguous intent to harm (Andersson & Pearson, 1999). Empirical research links WI to various negative organizational outcomes, including burnout, emotional exhaustion, workplace withdrawal, and decreased performance and creativity (Butt & Yazdani, 2021). The negative consequences of incivility have been documented by previous researchers on employee attitudes and behaviors in the shape of knowledge hiding (Arshad & Ismail, 2018), low organizational commitment (Kabat-Farr et al., 2018), decreased job satisfaction (Jamal & Siddiqui, 2020), and decreased citizenship behavior (Yao et al., 2022). In response to incivility, individuals at the workplace may intentionally withhold knowledge by pretending that they lack access or awareness of the relevant knowledge/ information (Irum et al., 2020). KHB refers to the intentional withholding of valuable information, despite organizational efforts to promote knowledge sharing (Connelly et al., 2012). Employees often engage in rationalized hiding, playing dumb, or evasive knowledge hiding to avoid sharing requested information (Butt et al., 2023; Connelly et al., 2012). Research suggests that external pressures, dissatisfaction, and defensive motives contribute to KHB, negatively affecting organizational efficiency, employee trust, creativity, and turnover intentions (Cerne et al., 2017; Gagné et al., 2019; Jena & Swain, 2021). KHB is widespread across multiple domains, including the academic sector and healthcare, and results in reduced task performance, wasted resources, and impaired organizational innovation and commitment (Fong et al., 2018; Serenko & Bontis, 2016).

WI, which is an act of low-intensity deviant behavior characterized by unclear intent, has been steadily and reliably connected with poor psychological and behavioral consequences. As an illustration, Butt and Yazdani (2021) and Jamal and Siddiqui (2020) discovered that WI is positively linked to emotional exhaustion and low job satisfaction. Shahid and Kim (2019) extended the findings to show how responses in employees who experience WI might defensively respond to them through KHB as a retaliatory response or coping strategy. This is, however, not consistent with every study, as some exhibit differences in the directionality or strength of association. Indicatively, Fong et al. (2018) indicate that in cases where knowledge hiding is motivated by negative affect, it is only once in a while, as it is sometimes motivated by strategic self-protection or political actions, even in situations when no overt incivility occurs. This difference suggests a loophole in addressing the issue of emotional versus strategic

motifs of KHB, a dimension that is inadequately addressed in the collectivistic societies such as India, where a balance between interpersonal harmony can moderate the act of vengeance.

Also, though some research (e.g., Cerne et al., 2017; Irum et al., 2020) speaks about the psychological effect of WI, the limited research does not compare differences in sectoral or cultural translation of the incivility to knowledge hiding. As an example, Anand et al. (2023) showed a greater WI–KHB relationship in Indian IT companies, and in the study of East-Asian companies, Jeong et al. (2022) found that knowledge hiding came about more due to job insecurity than incivility. Such a contrast shows a theoretical discrepancy in the case of dominant antecedents in all organizational contexts. Therefore, it is necessary not only to establish the WI–KHB association in an Indian context but also to understand whether PCB can be considered to act as a unifying cognitive process mediating the effects of employees irrespective of the motive: emotional, cultural, or strategic.

Therefore, when employees experience uncivil behavior at work, they often feel disrespected or marginalized, prompting defensive responses like withholding information. Prior research (e.g., Arshad & Ismail, 2018; Wu et al., 2022) confirms that WI reduces trust and collaboration, thus encouraging KHB.

H_1: WI positively influences KHB.

Psychological Contract Breach as a Mediator

PCB refers to an employee's perception that their employer has failed to fulfill promised obligations, often resulting from unmet expectations or unfair treatment (Robinson & Morrison, 2000; Suazo, 2009). PCB arises when the psychological needs that motivate employees, such as trust, fairness, and communication, are neglected by the organization (Afshan et al., 2021). Factors influencing PCB include employees' perceptions and managerial behavior, where unmet promises can harm both the individual's current job satisfaction and future career prospects (Jain et al., 2022).

When managers demonstrate favoritism or unfair treatment, it can lead to a perceived PCB, prompting employees to engage in counterproductive behaviors such as WI and KHB (Ahmed & Zhang, 2024; Bari et al., 2023). The breach of psychological contracts damages trust and weakens interpersonal relationships, fostering an atmosphere of distrust and dissatisfaction that hinders knowledge sharing (Bari et al., 2023). As a result, employees may purposefully withhold knowledge during meetings or demonstrate reduced engagement and productivity (Ghani et al., 2020). In this context, knowledge hiding becomes a defensive response to the PCB, where employees retaliate by concealing information, which further disrupts organizational performance (Ahmed & Zhang, 2024). PCB not only diminishes individual contributions but also leads to broader organizational challenges by fostering a culture of distrust and lowering overall productivity (Afshan et al., 2021).

Incivility violates employees' implicit expectations of fairness, respect, and inclusion—core to the psychological contract. In the event of unmet expectations,

employees perceive a breach, as evidenced in studies by Ahmed and Zhang (2024) and Afshan et al. (2021).

H_2: WI positively influences PCB.

Employees who perceive a breach in psychological contracts often withdraw discretionary behaviors, such as knowledge sharing. This is supported by findings from Bari et al. (2023) and Ghani et al. (2020), which show PCB as a primary determinant of knowledge concealment.

H_3: PCB positively influences KHB.

WI indirectly increases KHB by first triggering a perception of contract breach. This mediating role of PCB is consistent with Suazo (2009), who argues that PCB serves as a psychological link between workplace mistreatment and retaliatory behaviors like knowledge hiding.

H_4: PCB mediates the relationship between WI and KHB.

Ethical Leadership

According to Brown and Treviño (2006), EL involves being fair, trustworthy, and respectful, helping create an atmosphere that encourages morally right behavior. The study shows that EL means three things: acting ethically, treating individuals equally, and keeping an eye on morality (Mayer et al., 2012). As a "moral manager," a person must set ethical principles, give praise for ethical actions, and discourage bad actions which directly influence WI and how the workplace operates. Those who lead ethically make it clear that undertaking manipulative actions will have negative results (Den Hartog, 2015). Employees are motivated to follow ethical standards by their leaders who then shape their satisfaction, work performance, and willingness to share knowledge (Bedi et al., 2016). Creating employee training in the learning organization means giving workers clear boundaries, which reduces the instances of unethical actions (Hsieh et al., 2020). By rewarding transparency and punishing unethical actions, ethical leaders foster an environment where concealing or falsifying information is discouraged. Empirical studies show that EL significantly undermines employees' engagement in knowledge hiding (Anser et al., 2020). Ethical leaders are seen as role models who guide employees toward ethical conduct and away from behaviors like KHB. Therefore, EL is expected to moderate the relationship between WI and KHB, reducing the probability of employees engaging in knowledge hiding despite incivility in the workplace. Ethical leaders act as moral role models and reduce the impact of toxic behaviors by promoting trust and transparency. Studies by Brown and Treviño (2006) and Anser et al. (2020) support EL's buffering role in mitigating the negative consequences of WI.

H_5: EL moderates the relationship between WI and KHB, such that the relationship is weaker under high EL.

Theoretical Framework

Social Learning Theory

We have adopted the social learning theory (Bandura & Adams, 1977) in this study to explicate whether and how WI, PCB, and EL relate to knowledge hiding in the workplace. Social learning theory suggests that individuals are likely to emulate the behavior of role models within professional settings. Accordingly, ethical leaders' proactive communication about what is (un-)ethical behavior and their open and transparent knowledge sharing give employees a model of what is (in-)appropriate behavior at work (Bouckenooghe et al., 2015; Gok et al., 2017). Thus, social learning theory may be a valuable lens for investigating why employees are less likely to hide or conceal their knowledge while under EL (Men et al., 2020). Drawing insights from social learning theory (Bandura & Adams, 1977), we explored the influence of WI and EL on employees' KHBs. Furthermore, the research investigates the underlying psychological processes by which WI impacts employees' tendencies to hide knowledge.

Conservation of Resources (COR) Theory

In accordance with Hobfoll's COR theory from 1989, people make a concerted effort to develop, protect, and preserve their assets. Assets are elements that hold significance because they make it easier to obtain or preserve other valuable resources (Hobfoll, 2001), and they are a way to acquire more things, energies, conditions, or individual traits (Hobfoll, 1989). Resources include things, situations, and states that have value to people. COR theory explains the motivation of employees to place a strong emphasis on preserving one's resources and knowledge. As per the COR theory, a lack or loss of valuable resources could make life difficult for people when they encounter new stressors (Hobfoll, 1989). As a result, these people might exhibit more unfavorable work outcomes to make up for the resource loss, and they may display defensive behavior as well as show reluctance to divulge their knowledge when they perceive an existential threat to their reserves, becoming knowledge hiders. Therefore, the COR theory can be used to clarify how rudeness at work affects knowledge hiding.

The inclusion of both social learning theory and COR theory offers a complementary understanding of KHB. While social learning theory explains how employees observe and replicate EL to model prosocial knowledge-sharing behaviors, COR theory addresses the defensive reactions to resource loss caused by incivility. Using both frameworks enables the study to capture both the social-cognitive process (through leadership influence) and the resource-protection mechanism (through PCB) that jointly drive knowledge hiding. Thus, their integration strengthens the explanatory power of the model across both motivational and behavioral dimensions.

Research Methodology

Data Collection

The study used a structured questionnaire comprising established and validated scales from prior peer-reviewed studies. WI was measured using the 12-item scale adapted from Cortina et al. (2001). PCB was assessed using the 8-item scale by Robinson and Morrison (2000). KHB was measured with the 12-item scale from Connelly et al. (2012), and EL was evaluated using the 10-item scale by Brown and Treviño (2006). Responses were measured using a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree).

Prior to data collection, the study adhered to ethical research guidelines. While formal approval was not sought from a university ethics board due to the nonsensitive and anonymous nature of the survey, all participants were provided with an informed consent form explaining the purpose of the study, ensuring confidentiality and voluntary participation. No personal identifiers were collected. Snowball sampling was chosen due to the challenge of accessing a large, diverse sample of full-time professionals across different sectors in India. It enabled researchers to reach employed individuals across regions through professional networks, especially during ongoing remote and hybrid work arrangements. However, this nonprobability sampling method may limit generalizability, as the sample may overrepresent certain sectors or networks. This limitation is acknowledged, and future research is encouraged to use stratified or random sampling for broader representativeness.

Participants responded to survey questions using a 5-point Likert scale, from disagreeing to agreeing and the survey was completed from July to September 2023. We followed Faul et al. (2009) and used G*Power software to set the number of respondents necessary for our study. To make sure the power is at 0.80 and the alpha level is 0.05, it was decided that 159 is the minimum sample size. The high number of participants, 388 versus only 159 required, made this study able to follow the criteria for sample size.

Common Method Bias

Common method bias (CMB) is a major issue that must be taken into account when carrying out a survey, as it often happens. This predominantly takes place when data are collected from a single resource (Avolio et al., 1991). A full collinearity approach, as outlined by Kock (2015), was applied to check if the CMB exists within the variance inflation factor (VIF). All the constructs used in this study had an inner VIF value below the threshold of 3.3. As a consequence, our study could not point to CMB as an issue. SRMR measures how accurately the model describes the data and it needs to be lower than 0.08 (according to Henseler et al., in 2015). With the current model, the SRMR is 0.072, which is under 0.08, the critical value. The research model's predicted correlation matrix matched the empirical one and had an SRMR smaller than the reasonable critical value.

Table 1. Construct Validity.

Construct	Items	Factor Loading	Rho_A:rho_c	AVE
Workplace incivility	WI_1	0.693	0.912:0.930	0.656
	WI _2	0.582		
	WI _3	0.695		
	WI _4	0.648		
	WI _5	0.703		
	WI _6	0.651		
	WI _7	0.590		
	WI _8	0.629		
	WI _9	0.515		
	WI _10	0.598		
	WI _11	0.623		
	WI _12	0.649		
Psychological contract breach	PCB_1	0.638	0.908:0.926	0.645
	PCB_2	0.576		
	PCB_3	0.613		
	PCB_4	0.722		
	PCB_5	0.688		
	PCB_6	0.745		
	PCB-7	0.781		
	PCB_8	0.726		
Knowledge-hiding behavior	KHB_1	0.574	0.906:0.909	0.609
	KHB_2	0.546		
	KHB_3	0.657		
	KHB_4	0.734		
	KHB_5	0.755		
	KHB_6	0.762		
	KHB_7	0.752		
	KHB_8	0.744		
	KHB_9	0.743		
	KHB_10	0.725		
	KHB_11	0.743		
	KHB_12	0.711		

Measurement Model

Internal consistency reliabilities, composite reliability, and Henseler's rhoA for reflective constructs were used to evaluate the measurement model within the tolerance range of 0.70–0.95 (Hair et al., 2019; Sarstedt et al., 2021) (see Table 1). Average variance extracted was utilized to determine convergent validity; some of the reflective constructs did not exceed the threshold of 0.50. In the case of such constructs, the composite reliability exceeded the limit of 0.60, thus reaching the necessary value. All reflective constructs exceeded the critical value of 0.50 (Sarstedt et al., 2021).

Table 2. Discriminant Validity.

	KHB	PCB
PCB	0.780	
WI	0.835	0.722

Note: KHB: Knowledge-hiding behavior; PCB: Psychological contract breach; WI: Workplace incivility.

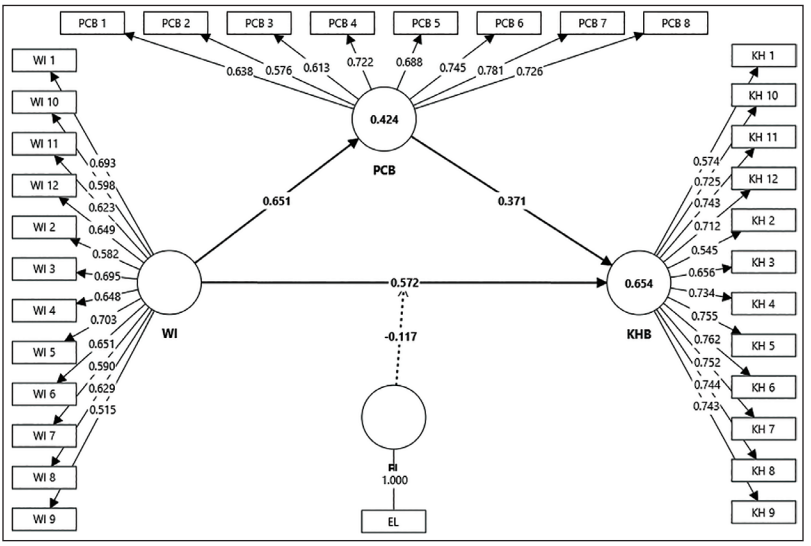

Figure 1. Structural Model.

Heterotrait–monotrait (HTMT) ratio of correlations was employed to test the discriminant validity (Henseler et al., 2015). HTMT was 0.65, which was below the tolerance limit of 0.85 (Gold et al., 2001) (see Table 2). Thus, it is concluded that the discriminant validity of the current measurement model is not impacted.

Structural Model

The evaluation of the structural model (see Figure 1) was carried out in agreement with the recommendations made by Sarstedt et al. (2021). The VIF inner values, which were discovered to be less than the critical value of 3.33 (Hair et al., 2019), were used to assess the collinearity issues. The structural model was evaluated based on the following metrics: path coefficients (β), R^2, F^2, and confidence interval for examining the causal relationships between the investigated latent variables (Sarstedt et al., 2021). Variation in the model is shown by the R^2 value. With the estimated R^2 for the latent variables, the explanatory power of the model has improved, as seen in KHB's R^2 value of 0.651 and PCB's R^2 value of 0.424.

WI explains 42% of the differences seen in PCB and 65.1% in the variance of KHB. Hypothesis testing using the bootstrapping method was followed by the previous step. Moreover, 10,000 subsamples of bootstrapping were used to

Table 3. Structural Model Assessment.

Hypothesis	Dependent Variable	Relationship	Path Coefficient (β)	Confidence Interval	VIF	f^2	Results
H_1	WI	WI–KHB	0.510***	[0.469; 0.697]	1.331	0.648	Accepted
H_2	WI	WI–PCB	0.651***	[0.478; 0.701]	1.000	0.761	Accepted
H_3	PCB	PCB–KHB	0.376***	[0.230; 0.459]	1.281	0.346	Accepted

Table 4. Mediation Analysis.

Hypothesis	Path Relation			VAF	Result
H_4	WI–PCB–KHB	DE	0.510	0.323	PME (VAF 0.20 < 0.80)
		IDE	0.65		
		TE	0.376		
			0.754		

Notes: WI: Workplace incivility; EL: Ethical leadership; KHB: Knowledge-hiding behavior; DE: Direct effect; IDE: Indirect effect; TE: Total effect; VAF: Variance accounted for; PME: Partial mediation.

evaluate the structural model results (Sarstedt et al., 2021). Table 3 depicts the results of the structural model. H_1, H_2, H_3, and H_4 are supported as a result of the findings that WI exhibits a strong and favorable effect on KHB (β = −0.651, p = .01), PCB (β = −0424, p = .01), and PCB has a significant and positive effect on KHB (β = −0.376, p = .01) (see Table 3).

F^2 values of 0.02 to 0.15 indicate small effects, 0.15 to 0.35 indicate medium effects, and f^2 values of >0.35 indicate large effects. All combinations of the variables in the study showed small, large, and medium effect sizes. Such values confirm that the research model is very useful for forecasting.

According to hypothesis 4, PCB appears to mediate the relationship between WI and KHB. The impact of PCBs on employee attitudes is shown in Table 4. The partial mediation of knowledge hiding by workplace rudeness is supported by a VAF of 0.323 (VAF 0.20 < 0.80).

Moderation Analysis

The moderation analysis shown in Figure 2 investigates the role of emotional labor (EL) in influencing the strength of the relationship between WI and KHB, testing hypothesis 5. The interaction plot includes two simple slopes: one for low EL (red line) and one for high EL (green line). These lines illustrate how the effect of WI on KHB varies depending on the level of EL required from employees. At low levels of EL, the red slope indicates a weaker positive relationship between WI and KHB. These findings indicate that employees who are less involved in

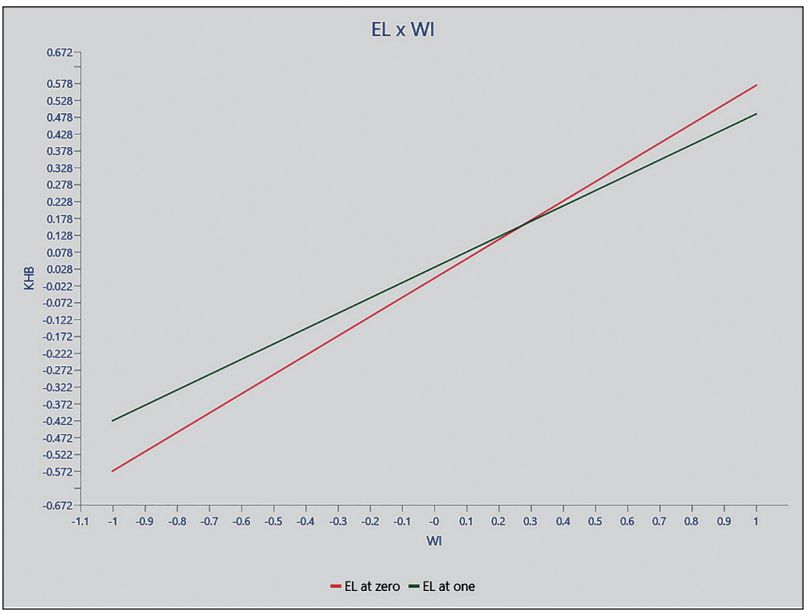

Figure 2. Moderation Analysis.

Note: EL: Ethical leadership; WI: Workplace incivility.

emotional regulation may experience incivility as less psychologically depleting; therefore, they are less inclined to engage in knowledge hiding as a defense. These individuals may emotionally detach or employ disengagement strategies to cope with incivility, thereby buffering its negative impact on knowledge-sharing behaviors (Chi et al., 2013).

In contrast, at high levels of EL, the green slope becomes significantly steeper, revealing a stronger positive relationship between WI and KHB. EL, particularly deep acting, is linked to sustained emotional regulation and increased cognitive load (Grandey, 2000), which may leave employees more susceptible to negative events like incivility. When emotional reserves are depleted, knowledge hiding can emerge as a coping mechanism, a way to conserve remaining psychological and interpersonal resources (Hobfoll, 1989; Liu & Roloff, 2015). The results align with the COR theory, which posits that individuals strive to obtain, retain, and protect resources. When EL is high, and employees are simultaneously exposed to incivility, they are likely to perceive themselves as resource-depleted, prompting defensive behaviors like knowledge hiding (Halbesleben et al., 2014). Moreover, EL may amplify emotional sensitivity, making even low-intensity incivility more impactful (Rupp et al., 2008). The positive interaction between EL and WI, therefore, suggests that EL exacerbates the negative consequences of incivility. Employees who are both emotionally taxed and mistreated are more prone to retreat from organizational citizenship behaviors, such as knowledge sharing, and instead may act in ways that protect themselves, even if counterproductive. This highlights the critical need for organizational interventions. When emotional

display rules are rigid and incivility is unchecked, employees operate in environments that facilitate both psychological exhaustion and covert retaliation. To prevent the deterioration of knowledge-sharing culture, organizations must prioritize emotional support systems, encourage civility training, and implement emotional regulation flexibility in service roles.

Discussion

The rapid expansion of globalization has led to greater difficulties for companies to compete in today's knowledge economy. Firms in this environment have to respond quickly to new market trends and make use of their team members, as their experienced staff gives them a strong advantage (Miceli et al., 2021). Still, using employees' skills and knowledge properly depends on having effective KM (Lam et al., 2021). It includes merging staff members' skills with the things a company has and the procedures it uses to support innovation. Being successful as an organization mainly depends on acquiring and sharing knowledge to strengthen innovation. Despite organizations working to encourage people to share knowledge, many actively withhold it (KHB). KHB concerns organizations greatly because it disrupts teamwork, reduces creativity, and damages how well an organization performs (Jeong et al., 2022). Grounded in social learning theory, this research explores the function of WI in influencing KHB. WI is defined as low-intensity deviant behavior characterized by ambiguity in its intent to harm (Andersson & Pearson, 1999). It disrupts workplace dynamics, erodes trust, and fosters negative attitudes, potentially leading employees to withhold knowledge as a form of self-protection or retaliation (Irum et al., 2020). This study also explores the mediating role of PCB and the moderating influence of EL in the WI–KHB relationship.

Results from the current study confirmed hypothesis 1, that WI raises KHB. This result is compatible with previous studies (Agarwal et al., 2024; Anand et al., 2023), which demonstrated that incivility causes employees to hide their knowledge from colleagues. Subjects of incivility might restrict their sharing of information to relieve the stress caused by dealing with people in stressful or unpleasant situations. With rising rude behavior, individuals are less inclined to share their experience with the group, which reduces both innovative and effective performance in the organization (Bijalwan et al., 2024). Moreover, the researchers looked at whether PCBs affected how WI was linked to KHB. Data revealed that Bari et al. (2023) and Ghani et al. (2020) were right about PCB being a crucial element that shapes KHB. Psychological contracts explain the personal commitments employees think should exist between them and their employer. When employees feel these rules are broken, for example, when what was promised to them is not delivered or if they receive unfair treatment, they go through a psychological contract break (Bari et al., 2023). A breach of this trust causes employees to feel upset and betrayed by their workplace. Thus, employees could try to withhold information in response. Research supports this point by showing that when anticipated outcomes fail to materialize, it often leads employees to hide important information (Ghani et al., 2020). This meant exploring whether EL had a

function in blocking the effects of WI on KHB. Moral role models, ethical leaders foster a fair, trusting, and open environment among their team (Brown and Treviño, 2006). Higher EL was shown to significantly decrease the negative effects of WI on KHB (Anand et al., 2023). Ethical leaders outline what good behavior should look like, stop knowledge hiding, and ensure that openness and respect are valued throughout the team (Almeida et al., 2022). Even though employees' personal beliefs could influence how they respond to leaders, extensive research has consistently demonstrated that ethical leaders have a strong influence on their employees (Almeida et al., 2022; Hassan et al., 2023).

The study's outcomes are in agreement with the existing literature that links WI to increased knowledge hiding (e.g., Anand et al., 2023; Arshad & Ismail, 2018), affirming that WI undermines trust and promotes defensive knowledge behaviors. In contrast to earlier studies, this research offers a culturally grounded perspective from India, where hierarchical work structures and relational norms shape employee responses. For example, Agarwal et al. (2024) found that Indian employees often internalize incivility, which may exacerbate cognitive strain and trigger knowledge withholding even in the absence of overt conflict. Moreover, this study sets itself apart by empirically validating PCB as a partial mediator, a mechanism not extensively tested in prior Indian studies on knowledge hiding. While Ghani et al. (2020) and Bari et al. (2023) proposed the role of psychological mechanisms, our findings quantify this mediating path and establish its significance (VAF = 0.323). Additionally, the moderation analysis highlights that EL can significantly weaken the negative effects of WI on knowledge hiding, extending the theoretical application of social learning theory and COR theory to Indian knowledge workers. Most Indian and Asian studies tend to focus on either antecedents of incivility or implications of knowledge hiding in isolation. This study integrates both antecedent (WI), mediator (PCB), and moderator (EL) in a unified structural model, offering a holistic explanation of how toxic behavior translates into dysfunctional knowledge practices and how leadership can counteract this trajectory.

Implications

The research has a substantial contribution to the field of psychological management. This study shed light on WI and its adverse impacts on employees' KHB. First, it adds to the theoretical foundation of the WI. This research is based on theories such as social exchange theory and COR theory. The impact of WI contributes to the theories of social exchange theory and COR theory. Once a psychological contract in an organization is ruptured, resources erode. These resources are disrupted, and employees begin to behave negatively. This situation leads to the hiding of necessary knowledge (Ghani et al., 2020). In this way, the performance of firms gets compromised. Current research findings also add to the KM theory by indicating that KH at any level of organization badly affects productivity (Anand et al., 2023). Hence, it adds to the body of existing research by suggesting the precursors of employees' KHBs. Moreover, the results strengthen the social exchange theory by suggesting that incivility in workplace leads to PCB and KHB.

This research provides valuable insights for managerial practice. It offers insights to the managers and executives of the firms. The executives must pay heed to the psychological contracts of the employees (Bari et al., 2023). They should not disregard the psychological contracts. Managers and executives should take steps toward eradicating KH behaviors and they should foster a supportive and positive environment for the staff, which inspires them to participate in morally good practices in the workplace. Overall, this research is quite helpful for future researchers. Employees could be coached on how norms for respect develop (i.e., through fair and respectful treatment) and activities that disrupt these norms from forming (i.e., through unjust or unkind treatment from leaders) (Gosselin & Ireland, 2020). Failure to address incivility can lead to employees perceiving discrepancies between what leaders advocate and what is practiced, worsening workplace morale. It is also imperative that leaders deliberately cultivate and model the type of interpersonal behavior that conveys a clear message of respect. That is, managers should follow through on what they encourage while minimizing gaps between stated causes and perceived behaviors. Leaders who assert that they promote a respectful workplace but do not appropriately discipline employees who engage in harassing behaviors toward others may foster employees' negative perceptions of norms for respectful treatment (Andersson & Pearson, 1999). Coaching leaders to develop the skills needed to be respectful of others represents a viable point of intervention (Olsen et al., 2020). Finally, when organizations identify and plan specific interventions to check incivility, they must consider the impacts of coworkers on employee perceptions of the normative environment, in addition to the role of charismatic and EL in fostering positive norms for respect (Walsh et al., 2017).

This study extends COR theory by empirically demonstrating how perceived WI leads to resource depletion through PCB, ultimately triggering defensive behaviors such as knowledge hiding. COR theory posits that individuals strive to conserve valued resources such as trust, emotional energy, and psychological safety and respond to threats with protective mechanisms. This research contributes a novel insight by positioning knowledge hiding as a behavioral manifestation of resource conservation within the realm of social contract violations. Moreover, by showing that the effect is conditioned by the presence of EL, the study adds depth to COR theory by integrating social–environmental buffers that can mitigate the loss spiral. This positions COR not only as a stress–response model but also as a framework that accounts for the interactive role of leadership in resource protection and restoration.

Limitations and Future Scope

In line with existing social research, this study has some limitations that may serve as an opportunity for scholars to conduct further research. First, the sample size of this study is limited, and hence the findings may not be generalizable; future research may increase the sample size to improve the reliability of the results. A longitudinal approach may be beneficial for future research to understand the impact of WI, as it has been posited that longer time frames may be

suitable, as it can take time to recognize a pattern of incivility in the workplace (Cortina et al., 2017). Second, a structured questionnaire is employed in this research to collect data; future studies may consider other data collection methods, such as semi-structured, open-ended, and interview methods to as to get more detailed and in-depth information. Third, this study analyzed the impact of WI on KHB, through the mediating effect of PCB. Subsequent research could incorporate additional mediating variables such as cynicism and emotional exhaustion to broaden the understanding of the other antecedents which impacts employees' KHB. Finally, this study predicts the moderating role of EL; future studies may further introduce other moderating variables like spiritual leadership, servant style leadership or workplace spirituality to validate the present study's findings.

Conclusion

This study provides clear empirical evidence that WI significantly increases KHB among employees, wherein PCB functions as a key mediating mechanism. Additionally, it shows that EL acts as a modifier in this dynamic, helping to reduce the negative impact of incivility on knowledge-sharing practices. These findings are significant as they demonstrate how organizational climate and leadership style can either erode or protect critical intangible resources like trust and collaboration, especially in knowledge-driven industries. By validating this framework in an Indian context, the study contributes culturally grounded insights to both COR theory and social learning theory, showing how psychological resource loss and observational learning processes interact in shaping employee behavior. Future research should replicate this model using longitudinal data to capture the dynamic evolution of contract breach and knowledge hiding over time. Additionally, incorporating qualitative methods may reveal deeper narratives behind why employees conceal knowledge and how leaders actively intervene in such situations.

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