Volume 3 • Issue 1
January 2025

BHUBANESWAR

jim.imibh.edu.in
e-ISSN: 2583-8326

IMIB Journal of Innovation and Management

e-ISSN: 2583-8326

IMIB Journal of Innovation and Management is published biannually in January and July by International Management Institute (IMI), Bhubaneswar.

IMIB Journal of Innovation and Management is hosted on our web-based online submission and peer review system. Please read the manuscript submission guidelines on the journal website, and then visit https://peerreview.sagepub.com/jim to login and submit your article online. Manuscripts should be prepared in accordance with the 7th edition of the *Publication Manual of the American Psychological Association*.

Annual Subscription: Individual rate (print only) ₹1,580; institutional rate (print only) ₹2,760. For orders from Pakistan, Bangladesh, Sri Lanka and Maldives, SAARC rates apply: individuals $35; institutional rate $50. Prices include postage. Print subscriptions are available for institutions at a discounted rate. For subscriptions, please write to: customerservicejournals@sagepub.in

Change of Address: Four weeks' advance notice must be given when notifying change of address. Please send the old address label to ensure proper identification. Please specify the name of the journal and send change of address notification to customerservicejournals@sagepub.in

Printed and published by Dr. Shiv Pratap Verma, Chief Administrative Officer, International Management Institute Bhubaneswar, on behalf of International Management Institute Bhubaneswar, IDCO Plot No. 1, Gothapatna, PO: Malipada, Dist.: Khurda, Bhubaneswar 751003, India. Printed at Sai Printo Pack Pvt Ltd, A 102/4 Phase II, Okhla Industrial Area, New Delhi, Delhi 110020.

Editor: Sangram Keshari Jena

IMI
INTERNATIONAL MANAGEMENT INSTITUTE
BHUBANESWAR

About the Journal

The journal is born out of IMI Bhubaneswar's emphasis on one of the key pillars of its sustenance–research. IMI Bhubaneswar, a young institution with a rich legacy, has always been at the forefront to push the horizons of research awareness within the academic fraternity. The journal aims to serve as a forum for creation and dissemination of knowledge on innovations and its application to solve challenges in business management. The journal is international and interdisciplinary in nature.

The main focus of the journal is to provide a platform to the academicians and practitioners to discuss innovations and their implications on business management and processes. It focuses on bridging the gap between academia and industry for cross fertilization of ideas leading to effective dissemination of innovative solutions in emerging areas. The journal features research papers across function areas on topics such as customer relationship management (CRM); market segmentation; supply chain management; data mining tools & techniques; block chain; artificial intelligence (AI); internet of things (IoT); customer lifetime value (CLV); economics of information technology; cloud applications; cyber security; mobile computing; geographic information systems (GIS); information systems and ethics; sustainability; green computing; digital marketing; social media; social analytics; supplier relationship management; enterprise solutions; virtualization; cognitive science; governance; entrepreneurship; design thinking; VR or augmented based learning and development; HRMS and HR score card; people analytics; automation in performance management; algorithm trading; RegTech; and FinTech.

The journal is primarily an application-oriented journal and therefore invites research papers that are based on evidence and produce findings that are implementable. The journal is impartial towards methodology used as long as it is robust and relevant.

The journal is open access, and the articles would be published under the Creative Commons licenses.

INTERNATIONAL MANAGEMENT INSTITUTE
BHUBANESWAR

Aims and Scope

IMIB Journal of Innovation and Management offers a platform for interface between emerging business management problems and evolving innovative techno-management solutions. It serves as a platform for seamless integration of methodological, technological and disruptive developments, and their business applications. We publish articles which address research in technology, techniques, processes and applications in business. The journal, therefore, bridges the gap between academia and industry for cross fertilization of ideas leading to effective dissemination of developments in emerging areas.

IMIB Journal of Innovation and Management is an interdisciplinary journal in the area of business management which captures developments in technology to facilitate application in business. The journal facilitates dissemination of knowledge on shifting techno-management paradigms and maps its cascading consequences on various facets of business (Marketing, Finance, OB HR, Operations, Strategy, Entrepreneurship, etc.). We encourage research that investigates the impact of innovations on various stakeholders such as customers, vendors, partners, etc. In pursuit of this endeavor, we publish scholarly research as well as practice papers offering unique insights.

Volume 3 Issue 1 January 2025

IMIB Journal of Innovation and Management

Contents

Original Articles

Original Article

Sustainable Development Using Green Finance and Triple Bottom Line: A Bibliometric Review

IMIB Journal of Innovation and Management
3(1) 7–28, 2025

DOI: 10.1177/ijim.231184138
jim.imibh.edu.in

Nazma[1], Rachna Bhopal[1] and Rita Devi[1]

Abstract

A primary framework of finance involves the acquisition and management of financial resources, such as lending, saving, investing, borrowing, budgeting and planning. Green finance is the fastest emerging sustainable finance, utilising public funds, commercial loans and micro-lending to promote sustainability at its most basic level. Green finance and sustainable development are two interconnected concepts that play a critical role in addressing global environmental challenges and promoting long-term economic growth and social well-being. The Triple Bottom Line is a powerful tool to attain sustainable development, as it evaluates the performance of organisations and projects based on three interconnected pillars: economic, social and environmental. The aim of the research article is to examine the effect of green finance on Triple Bottom Line using bibliometric analysis. The study is an outcome of bibliometric analyses of 405 articles retrieved from Scopus from years 1997 to 2022. The findings revealed the positive correlation of green finance with Triple Bottom Line (economic, social and environmental).

Keywords

Governance, green finance, sustainability, Triple Bottom Line

Introduction

A green finance approach is one that integrates finance and business with an environmental consciousness. It is an individual, regional, producer, investor

[1]School of Commerce and Management Studies, HPKVBS, Central University of Himachal Pradesh, Dharamshala, Himachal Pradesh, India

Corresponding author:

Rachna Bhopal, School of Commerce and Management Studies, HPKVBS, Central University of Himachal Pradesh, Dharamshala, Himachal Pradesh 176215, India.

E-mail: cuhp20rdmgmt14@hpcu.ac.in

and financial lender for various participants (Fatemi & Fooladi, 2013). Depending on the participant, green money can take several forms and be motivated by a desire to protect the environment, financial incentives or both (Jeucken, 2010). In comparison to typical financial functioning, the green economy lays a significant emphasis on environmental advantages and provides more attention to the environmental protection industry (Hoshen et al., 2017). World Bank (2021) determined the current scenario for green finance monitoring by examining the strategies for defining and assessing green finance mobilisation and ESG risk management. A survey of financial institutions was used to inform the analysis, which asked them which industries and activities included in the description of green finance. The following significant categories were among the respondents' top priorities: adaptability (conservation, bio system adaptation), carbon sequestration and storage, environmental protection (cogeneration, smart grid), energy efficiency (pollution control, prevention, and treatment), environmental friendly buildings, environmental friendly products and materials, energy from renewable sources (solar, wind, hydro), long-term land management (sustainable agriculture, forestry), transportation (metro/urban rail, electric, hybrid), waste disposal (recycling, waste management), drinking water (water efficiency, wastewater treatment) (Berrou et al., 2019). The green finance definitions share many similarities, such as renewable energy, green buildings and differences, Green bonds, green investments, green insurance, green credit and green infrastructural bonds are some of the major green finance products offered by banks (Akomea-Frimpong et al., 2022) such as nuclear power, noise reduction and carbon capture and storage (Green Finance, 2017). Green finance has the potential to significantly affect the environment and society, but there are many barriers to overcome, including a lack of awareness, inconsistent definitions, a lack of coordination between policymakers, inconsistent policies and a lack of incentives for investors and financial institutions (Ozili, 2022).

This article is based on bibliometric analysis and descriptive framework. Bibliometric analysis has conquered immense increase in usage as it is very effective in handling large volume of scientific data and producing high research impact (Donthu et al., 2021). Bibliometric provides the need for a quantitative investigation in formulating an overview, identifying key themes and for finding directions for future research in the subject domain (Pattnaik et al., 2020a). Bibliometric analysis and a rigorous literature review are performed to answer a series of research questions using specific bibliographic data retrieval process (Pattnaik et al., 2020b).

RQ1. What is the current trend of research in the area of green finance?
RQ2. Which are the leading, impactful sources adding to the literature of green finance?
RQ3. Which are prominent themes prevailing in the area of green finance?
RQ4. What is the essential perspective and history of green finance?
RQ5. How are green finance and Triple Bottom Line related for developing countries?

RQ6. What are the future challenges for green finance in the Indian financial system?

The research questions RQ1, RQ2 and RQ3 are analysed using bibliometric analysis, whereas secondary data are reviewed for analysis of questions RQ4, RQ5 and RQ6.

Purpose of Green Finance

Announcing its 'Intended Nationally Determined Contribution' at the 2018 United Nations Climate Summit, India declared it would double its renewable energy production target from 175 GW to 450 GW by 2020. In 2022, India plans to generate 100 GW of solar power, 60 GW of wind power, 10 GW of biomass power and 5 GW of hydropower (National Institution for Transforming India, 2018). The nation aims to reach net zero emissions by 2070. The Asian Development Bank estimated that in 2030 alone, India will have to pay $7.7 billion in acquisition costs in the energy sector to adapt to climate change (Press Information Bureau, Government of India, 2021).

Figure 1 includes public and private green investments in preparations and capital expenditures. Inclusion of products and services related to the environment (including water management and the protection of biodiversity and landscapes) elimination, minimisation, recompense of damages to the environment and climate (Lindenberg, 2014). The term 'green investment' refers to any investment that is environmental friendly.

Recent Drifts

According to the RBI, green finance has a lot of potential in India. In response to ambitious plans to reduce carbon emissions, the government has limited fiscal capacity to increase investment due to climate change goals. Figure 1 shows the Green Finance encompassing the range of financial tools, policies, and efforts directed at financing eco-friendly ventures and enterprises. It

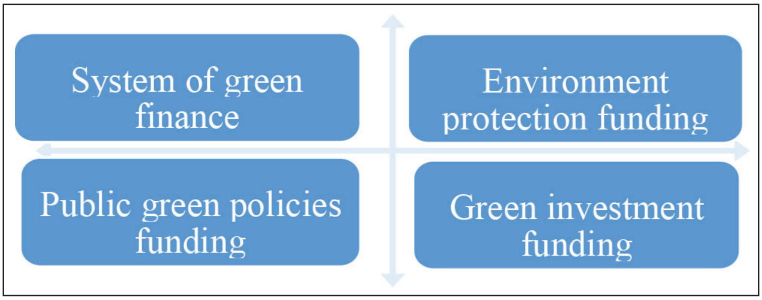

Figure 1. Structure of Green Finance.

Source: Lindenberg (2014).

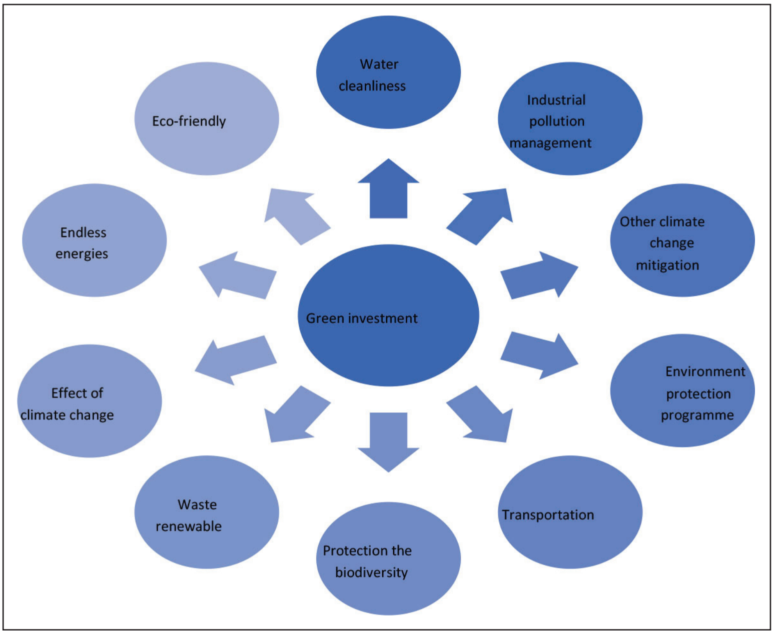

Figure 2. Diversity of Green Finance.

Source: Lindenberg (2014).

includes green bonds, loans, and sustainable investment funds, all complying with environmental standards and regulations to promote investments in climate-resilient and sustainable economic ventures. The government must take several corrective actions to avoid green finance blockades and develop strong policy measures in order to have its successful implementation (Gerster, 2011). Green finance is confronted with several obstacles, including structural impediments, supporting infrastructural facilities and a lack of clarity in policies and regulations. Green finance is available in India through a variety of channels (Robinson, 2001). Figure 2 shows the diversity of Green Finance including broad spectrum of financial tools, strategies, and methods that underpin environmentally sustainable and climate-resilient endeavors. The diversity defines green bonds, loans, sustainable investment funds, carbon markets, green insurance, and a multitude of policies and regulations geared toward addressing environmental issues and fostering sustainable progress. Few green finance products include green bonds, green insurance and other green finance investments. Indian Renewable Energy Development Agency issued a tax-free bond of ₹1,000 in 2014. In addition, in 2015, Yes Bank issued a 10-year green infrastructure bond. Overall, India was 33% of the way to fulfilling its 175 GW renewable installed power capacity target for 2022. However, the Indian government faces a significant deficit in the current fiscal year, making it harder to fund them (Charles & Philip, 2020).

History of Green Finance in India

India started emphasising green funding in 2007. The RBI published a notification on nonfinancial reporting, sustainable development and corporate social responsibility (CSR). They target the sustainable development is on global warming and climate change. The National Action Plan on Climate Change (NAPCC), which was developed in 2008, focuses on the broad framework of policies for the mitigation of the impacts of climate change. The Climate Change Finance Unit (CCFU), a coordinating agency for India's various green finance groups, was founded in 2011 within the Ministry of Finance. 2012: A significant strategic initiative since that year has been the adoption of sustainability disclosure standards. India started emphasising green funding in 2007. The RBI published a notification on nonfinancial reporting, sustainable development and CSR. The focus of sustainable development is on climate change and global warming. The NAPCC, which was developed in 2008, focuses on the broad framework of policies for minimising the effects of climate change. 2011: Within the Ministry of Finance, the CCFU was established as a coordinating body for India's many green finance organisations. From 2012 onwards, a significant strategic initiative since that year has been the adoption of sustainability disclosure standards (Ghosh, 2015).

There are a number of fiscal and financial incentives in place in India. These incentives are in line with India's goals under the 2015 Paris Agreement, which include reducing its intensity of greenhouse gas emissions by 33% to 35% below 2005 levels by 2030 and generating 40% of its installed electric capacity from non-fossil fuels. The Government of India offers the institutional, residential and social sectors in the majority of states a subsidy of 30% of the price of installing rooftop solar panels. In some category states, the assistance could account for up to 70% of the installation costs. Beneficiaries may also be eligible for a generation-based incentive of two units per generation if annual generation surpasses 1,100–1,500 kWh. In addition, extra power can be sold at a price determined by the government. Again, between 2015 and 2019, the India's government launched two phases of the FAME (Faster Adoption and Manufacturing of Hybrid and Electric Vehicles) (Buja et al., 2016). Scheme to enhance credit flow, reduce the upfront cost of all vehicles and create infrastructure (such as charge stations) in order to promote the development and sale of green vehicles. The State Bank of India has developed a 'green auto loans' programme for electric vehicles that gives a 20 basis point lower interest rate and a longer repayment window than conventional car loans in order to offset the high initial cost of such vehicles. The government has also developed a Production-Linked Incentive (PLI) Scheme for the production of high-efficiency modules in the field of renewable energy (Lindenberg, 2014). Through aggressive policy measures, the Reserve Bank has also promoted and supported green finance activities. In 2015, it expanded its 'Priority Sector Lending' (PSL) (Khan & Farooqui, 2021) programme to take into account the tiny renewable energy industry. Families are eligible for loans of up to 10 lakhs for renewable energy investment, while businesses in the renewable energy sector are eligible for loans of up to 30 crores (up from 15 crores commencing 4 September 2020). India said in September 2019 that it plans to produce 450 GW of renewable energy by 2030 (Kanungo & Gupta, 2021). About 20% of utility-scale electricity in the United States was generated by renewable sources in 2020, with hydropower (7.3%) and wind power making up the majority (8.4%). The fastest-growing source of power in the United States is solar energy, which will account for 3.3% of all generating in 2020 (including distribution). In 2020, the majority of the world's electricity came from hydropower, which accounted for 29% of all renewable energy sources (16.8%). Globally, a record-breaking 256 GW of new renewable energy capacity was built in 2020. More than 17% of all renewable energy utilised in the United States in 2020 was made up of renewable ethanol and biodiesel transportation fuels, a reduction from earlier years due to the COVID-19 epidemic. Modern renewables accounted for 11.2% of the global energy used for transportation, power and heating in 2019 compared with 8.7% a decade earlier. These sources include biomass, geothermal, solar, hydro, wind and biofuels. Renewable energy sources will generate 29% of the world's electricity by the year 2020. The total installed renewable power capacity increased by approximately 10% in 2020, with wind and solar PV accounting for the majority of the capacity additions (Da Rosa & Ordonez, 2021). The G20 and other nations have made tremendous progress in securing the billions of dollars in public and private resources necessary for sustainable development and climate action, according to new UN Environment data released on 14 July 2017. As much as 10 times that amount would be required internationally in the coming years, according to studies from the United Nations Conference on Trade and Development, the investment required to deliver sustainable development to developing nations is currently short of $2.5 trillion per year. The majority of this investment must come from private sources (Takamatsu et al., 2021).

The article is structured into eight sections, where 'Introduction' defined the introduction, 'Review of Literature' briefs a literature review followed by research methods and study design in 'Research Methods and Study Design', the results and discussion in 'Results and Discussion', the effect in 'Effect of Green Finance on Triple Bottom Line', the conclusion in 'Conclusion', future challenges in 'Future Challenges of Green Finance in Indian Financial System' and limitation of the study in 'Limitation of this Study'.

Review of Literature

Keerthi (2013) examined the latest trend and future potential of green finance in the rising market of India. This article discussed certain green projects and the need of implementing green finance in India. Vijai (2018) conducted the study to find out how knowledgeable clients think about green finance and green finance products. In addition, this study focused on private sector banks' green finance initiatives.

According to the findings, clients were aware of the green financing initiatives being programmed. Hoshen (2017), the researcher, investigated the allocation of green finance in various green projects in Bangladesh's banks and non-banking sector in this article. The study looked at current green finance efforts and their disbursement of direct and indirect funds in green finance. It also looked into Bangladesh Bank's green product refinance scheme. Reddy (2018) examined the importance, needs and requirements of green finance in India. In addition, this report focused on the impact of green financing on the Indian economy and government activities in this area. Sarangi (2018) in the report made it abundantly evident that there are many issues with India's renewable energy financing. Short loan periods, high capital costs and a dearth of sufficient debt financing are only a few of the traits of India's financial system as a whole that contribute to the challenge. Sectorial contours make it more difficult to raise the necessary finance due to technological peculiarities that demand high capital expenditures and essentially low operational costs. Jha and Bakhshi (2019) investigated the role of green finance in economic growth by directing the flow of funds from the governmental, private and non-profit sectors. This study looked into the various green financing channels for contributions in India and proposed numerous solutions to overcome the barriers to funding green items on the market. Sharma (2010) in the article looked for existing green banking literature where public sector banks and public sector enterprises promote goods, methods and technology that lessen environmental carbon footprints. The top banks from ICICI, HDFC, Executive Private Sector, SBI, PNB and Mumbai Public Sector have been selected (BBE and NSE and 2013–2012 Annual Report). Furthermore, compared to the selection, public banks are more active or pick private sector banks, and eventually become aware of the most current steps done by the Reserve Bank to promote such goods. Sarangi (2018) in this article, the researcher, examines the difficulties in obtaining the 175 GW of renewable energy target by 2022, with a particular emphasis on renewable energy in India. The researcher examines how these issues may affect the green development of the Indian economy by examining the installed capacities of various energy mixes as well as the compound average annual growth rate of India's power generation capacity. The article by Wang et al. (2021) aims to advance green finance research and discussion while clearly addressing policy-related questions about its implications for the energy sector. A description of four prospective green finance-related energy initiatives is also included. This study suggests that future research options include green bonds, government grants and carbon dioxide emissions. It also suggests that Fintech, big data and block chain can be used to further examine these topics. It also makes it easier to interpret green finance and energy policy research in a systematic and thorough way. Banks might improve financial inclusion, add to new finance solutions and help businesses stay afloat. Finally, from the standpoint of policy development, the findings of this study may aid regulators and managers in framing regulations that address the demands of all stakeholders while also positioning banks to gain a competitive advantage in the banking market.

Research Methods and Study Design

The study is an outcome of bibliometric analyses and a literature review of secondary data from Scopus, research articles, government reports and other publications. Bibliometric work analyse and classify the studies by framing graphical summaries of the previous work (Donthu et al., 2020).

Search Strategy and Data Retrieval Process

Table 1 presents the data retrieval process from Scopus database using the search criteria:

> TITLE-ABS-KEY ('Green Finance' OR ' Sustainable Finance') AND PUBYEAR > 2011 AND PUBYEAR < 2023 AND (LIMIT-TO (SUBJAREA, 'ECON') OR LIMIT-TO (SUBJAREA, 'BUSI') OR LIMIT-TO (SUBJAREA, 'MULT')) AND (LIMIT-TO (LANGUAGE, 'English')) AND (LIMIT-TO (DOCTYPE, 'ar') OR LIMIT-TO (DOCTYPE, 're'))

The data were subjected to bibliometric analysis using the R 4.0.3 package programme 'Biblioshiny', an R-based library and 'Bibliometric' web-based interface. Bibliometrics is an open-source software, has the features of flexibility, rapid upgrade and integration with other statistical R package, as it is very useful in an ever-changing science discipline such as Bibliometric (Aria & Cuccurullo, 2017). Unlike other literature review, bibliometric review establishes visualisation for large amount of domain-specific data (Goodell et al., 2021).

Results and Discussion

Research Trend and Scientific Productivity

Figure 3 shows an inclining research trend in green finance publications from 2012 to 2022. The graph depicts that the majority of the work on green finance is

Table 1. Bibliographic Data Retrieval Process.

Stage	Filtering Criteria	Eliminated	Accepted
1	Initial search result (on search term)	–	1,629
2	Year filter (2012–2022)	296	1,333
3	Subject filter (economics, econometrics, finance,business, management and accounting, andmultidisciplinary)	691	642
4	Language filter (English)	22	620
5	Document type (article, review)	159	461
6	Scimago ranking (Q1, Q2, Q3)	56	405

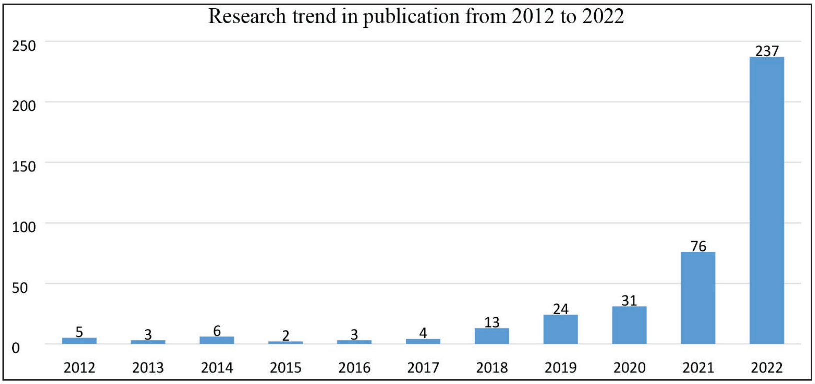

Figure 3. Research Trend in Publication on Green Finance from 2012 to 2022.

Table 2. Top 10 Journals on Green Finance.

Source	Publisher	NP	h index	Cite Score	SNIP	SJR	Country	Rank
Journal of Sustainable Finance and Investment	Taylor and Francis Ltd	45	20	4.5	1.241	0.642	United Kingdom	Q1
Journal of Cleaner Production	Elsevier Ltd	33	232	15.8	2.444	1.921	United Kingdom	Q1
Resource Policy	Energy Economics	22	80	7.6	1.996	1.461	United Kingdom	Q1
Energy Economics	Elsevier	18	168	11.3	2.347	2.549	Netherlands	Q1
Business Strategy and the Environment	John Wiley and Sons Ltd	11	115	11.9	2.289	2.241	United Kingdom	Q1
Economic Research Ekonomska Istrazivanja	Taylor and Francis Ltd	11	35	4.9	1.329	0.565	United Kingdom	Q2
Ecological Economics	Elsevier	9	220	10.9	2.084	1.778	Netherlands	Q1
Finance Research Letters	Elsevier BV	9	62	9.3	2.53	2.007	Netherlands	Q1
Economic Analysis and Policy	Elsevier BV	9	34	4.7	1.533	0.773	Netherlands	Q1
Global Finance Journal	Elsevier	8	37	4.6	1.605	0.614	Netherlands	Q2

Note: NP: no. of publications in study; SNIP: source normalised impact per article; SJR: scientific journal ranking.

published after the COVID-19 global pandemic. The scientific production of articles in the field is constantly increasing over the last three years with annual growth rate of 16.11%.

The Influence and Impact of Most Influential Journals on Green Finance

Table 2 lists the top 10 journals publishing the content on green finance, the name of publisher, number of papers (NP) of the journal in the study, h index, cite score, SNIP, SJR, country and SC imago ranking of the journal. Journal of Sustainable Finance and Investment stands at the highest list of the contributors to the study with 45 articles, followed by Journal of Cleaner production with 33 articles. The majority of the journals with Q1 ranking are the most influential source contributing to study. Journal of Cleaner Production and Ecological Economics from the list with highest h index 232 and 220 contributes to 19.25% of all the articles under review for the study. The influence and impact of the sources are

Table 3. Top 10 Authors Contributing to Study on Green Finance.

Author	Affiliated University	NP	h index
Farhad Taghizadeh-Hesary	Tokai University Japan	9	40
Yao Wang	Central University of Finance and Economics China	7	21
Chi-Chuan Lee	Southwestern University of Finance and Economics China	6	28
Yueyan Zhang	Southwest Jiaotong University	6	1
Naoyuki Yoshino	Keio University Japan & Tokyo Metropolitan University	5	22
Dongyang Zhang	Capital University of Economics and Business China	5	21
Ben Caldecott	Oxford University United Kingdom	4	9
Zhonglu Chang	Sichuan Tourism University China	4	7
Paola D'ORAZIO	Ruhr-Universitat Bochum Germany	4	6
Zheng He	School of Economics and Management Shanghai	4	1

presented in the forms of h-index, cite score, SNIP and SJR showing the growth in publications (Kuhn, 1970) on green finance by various publishers.

The Most Relevant Authors Contributing to the Study on Green Finance

Table 3 represents the top 10 most contributing authors to the study on green finance. Farhad Taghizadeh-Hesary has the highest number of nine articles and highest value of h-index Yao Wang contributes seven articles, followed by Chi-Chuan Lee and Yueyan Zhang with six articles each. Most of the authors contributing to study belong to China and Japan.

Most Cited Documents

Table 4 represents the most cited article undertaken for the study on green finance with total count and year of publication. Among the highly cited articles, the work of Taghizadeh-Hesary and Yoshino, 'The way to induce private participation in

Table 4. Top 10 Documents With Global Total Citations (TC).

Article Title	Author(s)	Year	TC
The way to induce private participation in green finance and investment	Taghizadeh-Hesary F., Yoshino N.	2019	280
How does green finance affect green total factor productivity? Evidence from China	Lee C.-C., Lee C.-C.	2022	217
Corporate green bonds	Flammer C.	2021	200
A bibliometric analysis on green finance: Current status, development, and future directions	Zhang D., Zhang Z., Managi S.	2019	185
The influence of firm size on the ESG score: Corporate sustainability ratings under review	Drempetic S., Klein C., Zwergel B.	2020	159
Sustainable business model archetypes for the banking industry	Yip A.W. H., Bocken N. M. P.	2018	151
Nexus between green finance, non-fossil energy use, and carbon intensity: Empirical evidence from China based on a vector error correction model	Ren X., Shao Q., Zhong R.	2020	134
Oil price shocks, geopolitical risks, and green bond market dynamics	Lee C.-C., Lee C.-C., Li Y.-Y.	2021	108
The role of green finance in reducing CO2 emissions: An empirical analysis	Saeed Meo M., Karim M. Z.A.	2022	101
Influence mechanism between green finance and green innovation: Exploring regional policy intervention effects in China	Irfan M., Razzaq A., Sharif A., Yang X.	2022	92

Table 5. Most Cited Countries.

Country	Total Citation	Average Article Citation
China	2,494	22.3
Italy	433	61.9
UK	367	16.7
Germany	362	13.4
India	326	14.8
Pakistan	201	25.1
France	194	27.7
Malaysia	154	51.3
Australia	143	10.2
Japan	116	16.6

green finance and investment' attains the topmost position with 280 total citations. Mostly the citation is above 100 for top 10 articles, whereas 18.07 is the average citation per document for the articles undertaken for the review.

Most Cited Countries

Table 5 represents the scientific production by the countries on green finance. China holds the topmost position with maximum count of 2,494 publications with 22.30 article citation frequency. The highest publication by the developed nation indicates the increasing trend of research on green finance. India stands on fifth rank with 326 total citations followed by other neighbouring countries.

Relationship Between Keywords

Figure 3 represents the co-occurrence network showing the relationship between keywords constituting the four clusters presenting the thematic analysis of co-citation network (Xu et al., 2018). Cluster 1 consists of 21 keywords, cluster 2 consists of 17 keywords, cluster 3 is formed of 7 keywords and cluster 4 comprises of 5 keywords. The relatedness of the items in the clusters can be explained by the distance between them (Goyal & Kumar, 2020). The co-occurrence network depicts green finance, sustainable development, China, green economy as the most explored keywords for the research. Co-occurrence of authors' specified keywords identifies the spatial links among the research on green finance (Baker et al., 2021).

Research Interest and Future Research Direction

The thematic map in Figure 4 represents the research interest and future research direction. The map is formed with nine clusters present in various themes. Green

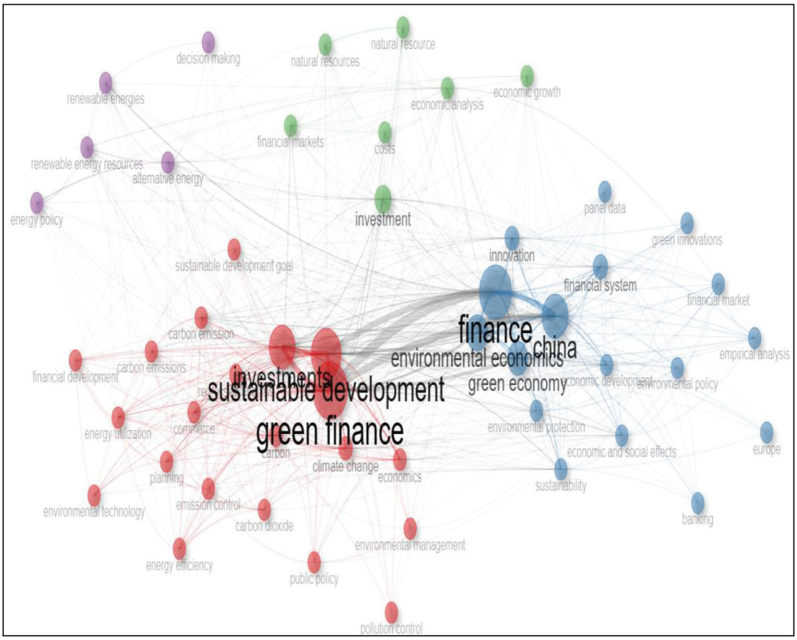

Figure 3. Co-occurrence Network.

Source: Biblioshiny.

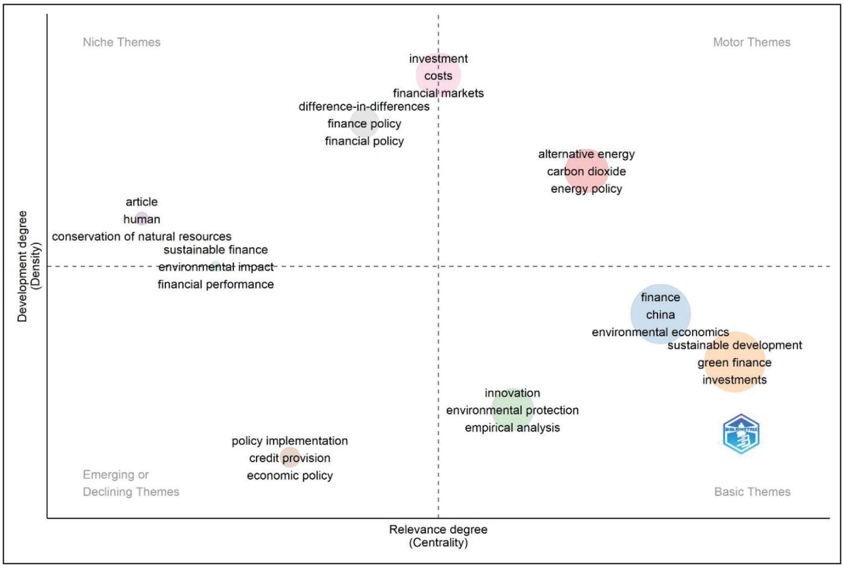

Figure 4. Thematic Map.

Source: Biblioshiny.

finance and sustainable development forms the cluster in basic theme (fourth quadrant) directing the emergence of exploration of the topic.

Effect of Green Finance on Triple Bottom Line

The Committee on Agriculture (2018) has established the '2030 Agenda for Sustainable Development', which endeavours to holistically address developmental challenges in the domains of society, finance and the environment. It seeks to achieve this objective through a harmonised strategy that fosters human progress towards sustainable development. Green finance helps accomplish the economic growth goal of sustainable development by encouraging environmental governance. In our everyday operations, we focus on environmental the protection and treatment of pollution in financial business, as well as promoting society's long-term growth through the management of social, economic resources. The impact of green finance on the Triple Bottom Line (environment, society, finance) is discussed briefly with supporting explanation.

Impact of Green Finance on Society

In terms of green finance and society, there is a positive correlation (Tang, 2020). The reviewed study states the green finance has a positive impact on society (Fatema et al., 2021). Green financing aids in alleviating poverty, indicates such as creative cities, regional green cities, increase the quality of life, digital governance and improve the standard of living. The Energy Agency, the G20 and the Intergovernmental Panel on Climate Change have released estimates on the total cost of climate change. The necessary financial resources to achieve the various Sustainable Development Goals these have their methodologies. On a macro level, estimates should be based on a bottom-up strategy, Improvement Investors, regulators and other market participants a raised awareness of the impending climate problem (Malerba et al., 2019).

Accordingly, each region's green finance development index and level of green finance development should be increased. It is necessary to increase financial assets. According to empirical evidence, financial support and poverty reduction have a positive link. The level of economic growth in all regions should be improved. According to empirical evidence, economic progress and poverty reduction have a positive association. We are increasing infrastructure investment. We can observe from the primary empirical research that infrastructure construction has a favourable impact on poverty reduction (Zhang et al., 2021). Green finance promotes the smart city. They created assessment indicators such as creative cities, regional green cities, quality of life and digital governance. They conducted brilliant city evaluation work in various countries worldwide to encourage the long-term development of smart cities. Scholars then conducted smart city performance reviews, devised innovative performance measurement frameworks and conducted empirical research (Fernando et al., 2019).

The critical areas of the promotion of public-private partnerships on finance mechanisms including green bonds and microcredit-based capacity building for community companies. Helping the public sector creates a suitable environment. The UN Environment will assist nations in reviewing their policy and regulatory settings for the financing system and developing roadmaps for sustainable finance through its resource efficiency initiative. By aiding central banks and regulators in enhancing the regulatory framework of domestic financial markets, it will also promote multi-country policy initiatives at the sub-regional, regional and international levels. In order to link green economic activities, UN Environment will build on current initiatives, such as private climate finance, and work with legislators and corporate executives. Through policy change, UN Environment will also encourage and enlighten public and private investment (Zueva et al., 2021).

Green finance has two key goals: internalising environmental externalities and lowering risk perceptions. Promoting green financing broadly and profitably assures that green investments prevail over assets used for business as normal, maintaining unsustainable growth trends. Green finance promotes openness and long-term thinking in investments aimed at environmental goals, and it incorporates all of the UN Sustainable Development Goals' requirements for sustainable development. Combine a bottom-up and top-down approach to green finance research: Organisations such as the Food and Agriculture Organization and the World Health Organization are just a few examples. The Energy Agency, the G20 and the Intergovernmental Panel on Climate Change have released estimates on the total cost of climate change. The necessary financial resources to achieve the various Sustainable Development Goals have their own methodologies. On a macro level, estimates should be based on a bottom-up strategy (Stern & Lankes, 2022). Improvement Investors, regulators and other market participants will have easier access to centralised, complete and up-to-date qualitative and quantitative data (United Nations, 2022). Green investing, which was once considered a niche sector, has grown in popularity due to a series of natural disasters that have raised awareness of the impending climate problem. In 2020, mint money invested in ESG funds total $51 billion, more than doubling the previous year's record (Gao et al., 2021).

Impact of Green Finance on Environment

There is a positive correlation between green finance and environment (Wang & Zhi, 2016). The reviewed study states the green finance has a positive impact on environment (Zhang & Wang, 2021). Green finance improves the environment quality, power sector increase, waste disposal, energy consumption and protecting the environment, reducing pollution and greenhouse gas emissions, and more regulators requiring companies to disclose climate-related risks, green finance is expected to continue growing, resulting in better data on which companies are most vulnerable and better insight on how to make a profit while saving the earth. Green finance sets targets for sustainable goals and fulfils them. International carbon prices hasten the shift to a green economy. In response to climate policy, investments in the power industry only rise close to 500 and 460 ppm stability scenarios over the first half of the century. Global investments in the power sector decline in the 680 and 560 ppm scenarios, as electricity demand declines as a result of high-efficiency gains brought on by climate legislation (Investopedia, 2021). Waste management, energy use and environmental protection were the three environmental development factors that six indicators were chosen to measure. Sulphur dioxide, solid waste and energy use all have a negative impact on the growth of green finance. The development of green finance is positively correlated with forests and natural reserves (Da Rosa & Ordonez, 2021). With most governments around the world focused on reducing pollution and greenhouse gas emissions, and more regulators requiring companies to disclose climate-related risks, green finance is expected to continue growing, resulting in better data on which companies are most vulnerable and better insight on how to make a profit while saving the earth (Carraro et al., 2012). Green finance gives some rules and regulations for the environment target period 2021–2030: double its renewable energy production 175 to 450 GW by 2020. Renewable energy was the fastest-growing energy, 42% increase between 2010 and 2020. In 2022, 100 GW solar power, 60 GW of wind power, 10 GW of biomass and 5 GW of hydropower. The 2020 goal is to generate 227 GW of electricity from renewable sources. India was 33% of the way to fulfilling its 175 GW renewable installed power capacity target for 2022 (Da Rosa & Ordonez, 2021).

Impact of Green Finance on Finance Sector

There is a positive correlation between green finance and finance sector (Latif et al., 2022). The reviewed study states the green finance has a positive impact on sector (Chen et al., 2022). Green finance improves the quality of investors, international development banks, researchers and policymakers seeking green finance data, new products (datasets) and services (research) could be created that provides a business model for data providers, bank lending, green bond, improve the standard of living, reduce poverty and increasing investment savings. The global awareness of climate change's systemic influence on the economy and financial system, as well as the resulting impact on financial stability, is evolving, and central banks and supervisors around the world are responding appropriately. The corporate and governmental sectors must build on our early achievements, recognising what we already know and quickly filling in the gaps around what we do not (Secretariat of the Convention on Biological Diversity, 2021). Create new services for clients who give or want data on green finance: With investors, international development banks, researchers and policymakers seeking green finance data, new products (datasets) and services (research) could be created that provide a business model for data providers. Bank lending—leverage the experience of green bonds: The Green Bond Principles define and track bonds straightforwardly. Similar methods should be implemented in the credit market, as well as maybe in equity investments. A new green designation for select companies can supplement existing energy-efficiency rules (Wu et al., 2020). Green finance focus on the financing condition of the people improving the standard of living, reducing poverty and increasing investment savings.

Conclusion

India must develop green finance methods and products to shape economic development in a sustainable manner. The results have shown an increasing research trend in green finance publications from 2012 to 2022, as the scientific production of articles in the field has constantly increased over the last three years with an annual growth rate of 16.11%. The bibliometric graph depicts that the majority of the work on green finance has been published after COVID-19. The Q1 ranking journals, Journal of Sustainable Finance and Investment, Ecological Economics and Journal of Cleaner Production are the most influential sources contributing to this study. China and Japan add majorly to this study with Farhad Taghizadeh-Hesary, Yao Wang, Chi-Chuan Lee and Yueyan Zhang as the top contributors to the green finance studies. The highest publication by the developed nation indicates the increasing trend of research on green finance. India stands at fifth rank with 326 total citations, followed by other neighbouring countries. Green finance and sustainable development form the cluster in the basic theme (fourth quadrant of thematic map), directing the emergence of exploration of the topic.

Green finance positively affects the Triple Bottom Line, as green finance is a tool that helps businesses achieve sustainable outcomes and address environmental and social challenges. By investing in green finance initiatives, businesses can generate financial returns while also contributing to the well-being of society and the environment. A green finance initiative promotes public-private collaborations in the form of green bonds, microcredit-based capacity building for small and medium-sized enterprises, and smart city initiatives. Green finance promotes openness and long-term thinking in investments aimed at environmental goals, and it incorporates all of the UN Sustainable Development Goals' requirements for sustainable development (SDGs) by creating assessment indicators such as creative cities, green cities, quality of life and digital governance. Sustainable finance aims at improving the standard of living of the people, reducing poverty and increasing investment savings. India needs to implement green financing, focus on regulatory policies that are more transparent, provide infrastructure-supporting facilities, create trust and confidence among investors, and focus on both domestic and international investors. Green finance and the Triple Bottom Line are important concepts in the modern business world, as more and more companies are recognising the need to prioritise sustainability and social responsibility in order to remain competitive and contribute to a healthier planet.

Future Challenges of Green Finance in Indian Financial System

Barriers in the Form of Structures

One of the key hurdles to Green Finance is effectively managing foreign exchange risk. Whether the money is green or not is also an issue related to small projects.

Infrastructure Supporting Facilities

Green finance's successful implementation will necessitate the strengthening of supporting infrastructure for the market to take off. Green projects are lacking in comparability, openness and reflectiveness.

Regulations and Policies

Green finance rules and regulations lack sufficient clarity. The majority of investors are therefore reluctant to take part in green finance prospects. Therefore, it is essential to create suitable standards and laws to draw investors and guarantee the scheme's efficiency (Charles & Philip, 2020). Currently, the world is facing COVID-19 and its effects on global economic expansion. Without a doubt, reviving the world economy is the most important problem in terms of policy right now. Economy, on the other hand, the pandemic has created a chance, the chance for all parties to reconsider the situation policies, as well as budgetary and operational plans they have taken and advocated for a strategy so far. In the long run, it is more environmentally sustainable. Green finance is unquestionably an essential tool that aid in such a change towards long-term sustainability expansion of the economy (Dzau et al., 2021).

India confronts difficulties in building its green financial market, including a lack of transparency brought on by inconsistent disclosure and verification standards for green bonds, as well as illiquidity brought on by a tiny investor base and low levels of environmental knowledge. The market relies heavily on the banking sector, and green investments tend to be geared towards renewable energy and energy efficiency. In addition, green debt securities do not have clear pricing advantages over conventional securities but are subject to greenwashing risks.

A future study could compare the findings from Scopus with other databases, such as Elsevier and Springer, to provide a more comprehensive understanding of the relationship between green finance and the Triple Bottom Line. Conducting surveys or interviews with stakeholders involved in green finance initiatives could provide additional insights and perspectives, enhancing the understanding of the impact on the Triple Bottom Line. Future research could incorporate case studies to explore specific examples of successful green finance projects and their effects on the Triple Bottom Line. This would provide in-depth analyses and practical implications for sustainable development. Also, extending the timeframe of the analysis to include more recent publications would enable the examination of evolving trends and changes in the relationship between green finance and the Triple Bottom Line over time. Incorporating interdisciplinary perspectives from fields such as economics, environmental science and social sciences could provide a more holistic understanding of the impact of green finance on the Triple Bottom Line. To find the impact assessment, future studies could explore methodologies to assess the direct and indirect impacts of green finance on environmental, social and financial outcomes, providing a more nuanced understanding of the Triple Bottom Line effects.

Limitation of This Study

The already published secondary data from academic articles have been used for the study. The depth of information or insights into particular aspects of the relationship between Green Finance and the Triple Bottom Line may be limited in the absence of primary data collection methods, such as surveys or interviews. For the bibliometric analysis, the study only used Scopus as a database for paper retrieval, which could result in a restricted representation of the literature on green finance and its effect on the Triple Bottom Line. The inclusion of other databases could prevent the analysis from being incomplete.

Acknowledgement

The authors extend their gratitude towards Mr. Manit Mishra, Editor of the *IMIB Journal of Innovation and Management,* for valuable comments that enhanced the manuscript. They also thank 'anonymous' reviewers and Mr. Debidutta Patnaik, Assistant Professor at IMI Bhubaneswar, for sharing their valuable research insights, though any errors remain the author's responsibility and should not tarnish the reputations of these esteemed persons.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding

Ms Rachna Bhopal is a recipient of Indian Council of Social Science Research Doctoral Fellowship. This article is largely an outcome of her doctoral work sponsored by ICSSR. However, the responsibility for the facts stated, opinions expressed and the conclusions drawn is entirely that of the author.

ORCID iDs

Rachna Bhopal https://orcid.org/0000-0003-2954-7838
Rita Devi https://orcid.org/0000-0003-3112-2425

References

Aria, M., & Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics*, *11*(4), 959–975.

Akomea-Frimpong, I., Adeabah, D., Ofosu, D., & Tenakwah, E. J. (2022). A review of studies on green finance of banks, research gaps and future directions. *Journal of Sustainable Finance & Investment*, *12*(4), 1241–1264.

Baker, H. K., Kumar, S., & Pattnaik, D. (2021). Twenty-five years of the Journal of Corporate Finance: A scientometric analysis. *Journal of Corporate Finance*, *66*(November 2019), 101572.

Buja, G., Mi, C. C., Choi, S. Y., & Rim, C. T. (2016). Modern advances in wireless power transfer systems for roadway powered electric vehicles. *IEEE Transactions on Industrial Electronics*, *63*(10), 6533–6545.

Berrou, R., Dessertine, P., & Migliorelli, M. (2019). *An overview of green finance. The rise of green finance in Europe: Opportunities and challenges for issuers, investors and marketplaces* (pp. 3–29). Palgrave Macmillan.

Carraro, C., Favero, A., & Massetti, E. (2012). Investments and public finance in a green, low carbon, economy. *Energy Economics*, *34*, S15–S28.

Charles, G., & Philip, B. (2020). Green finance: Recent drifts, confrontation and prospect opportunities for sustainable development in India. *MuktShabd Journal*, *9*(4), 1854–1865.

Chen, J., Siddik, A. B., Zheng, G. W., Masukujjaman, M., & Bekhzod, S. (2022). The effect of Green banking practices on banks' environmental performance and green financing: An empirical study. *Energies*, *15*(4), 1292.

Da Rosa, A. V., & Ordóñez, J. C. (2021). *Fundamentals of renewable energy processes*. Academic Press.

Donthu, N., Kumar, S., & Pattnaik, D. (2020). Forty-five years of Journal of Business Research: A bibliometric analysis. *Journal of Business Research*, *109*, 1–14.

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, *133*, 285296.

Dzau, V. J., Lurie, N., & Keusch., G. T. (2021). Urgent lessons from COVID 19: Why the world needs a standing, coordinated system and sustainable financing for global research and development. *The Lancet*, *397*(10280), 1229–1236.

Fatema, N., Zheng, G. W., Siddik, A. B., & Masukujjaman, M. (2021). Factors affecting the sustainability performance of financial institutions in Bangladesh: The role of green finance. *Sustainability*, *13*(18), 10165.

Fatemi, A. M., & Fooladi, I. J. (2013). Sustainable finance: A new paradigm. *Global Finance Journal*, *24*(2), 101–113.

Fernando, T., Agbali, M., Trillo, C., Ibrahim, I. A., & Arayici, Y. (2019). Are smart innovation ecosystems really seeking to meet citizens' needs? Insights from the stakeholders' vision on smart city strategy implementation. *Smart Cities*, *2*(2), 307–327.

Gao, X., Li, H., Wang, N., Ding, X., & Yang, X. (2021). Adaptively learning facial expression representation via cf labels and distillation. *IEEE Transactions on Image Processing*, *30*, 2016–2028.

Gerster, R. (2011). Sustainable finance: Achievements, challenges, outlook. *Striking a Balance Ahead of Rio*, 20.

Ghosh, S. (2015). *Building on the countercyclical buffer consensus: An empirical test*. South East Asian Central Banks, Research and Training Centre.

Goodell, J. W., Kumar, S., Lim, W. M., & Pattnaik, D. (2021). Artificial intelligence and machine learning in finance: Identifying foundations, themes, and research clusters from bibliometric analysis. *Journal of Behavioral and Experimental Finance*, *32*, 100577.

Goyal, K., & Kumar, S. (2020). Financial literacy: A systematic review and bibliometric analysis. *International Journal of Consumer Studies*, *45*(1), 80–105.

Green Finance, A. (2017). *Bottom-up approach to track existing flows*. International Finance Corporation.

Hoshen, M. S., Hasan, M. N., Hossain, S., Al Mamun, M. A., Mannan, A., & Al Mamun, A. (2017). Green financing: An emerging form of sustainable development in Bangladesh. *IOSR Journal of Business Management*, *19*, 24–30.

Investopedia. (2021). *Green investing*. https://www.investopedia.com/terms/g/green-investing.asp

Jeucken, M. (2010). *Sustainable finance and banking: The financial sector and the future of the planet*. Routledge.

Jha, B., & Bakhshi, P. (2019). Green finance: Fostering sustainable development in India. *International Journal of Recent Technology Engineering*, *8*, 3798–3801.

Kanungo, R. P., & Gupta, S. (2021). Financial inclusion through digitalisation of services for well-being. *Technological Forecasting and Social Change*, *167*, 120721.

Keerthi, B. S. (2013). A study on emerging Green Finance in India: Its challenges and opportunities. *International Journal of Management and Social Sciences Research*, *2*(2), 49–53.

Khan, B., & Farooqui, N. (2021). *Green finance: A shift towards sustainable economic growth*.

Kuhn, T. (1970). *The structure of scientific revolutions* (Vol I and II, Foundations of the unity of Science, Vol II, No 2).

Latif, S., Liu, H., Yao, P., Aslam, S., & Iqbal, N. (2022). Impact of green financing, FinTech, and financial inclusion on energy efficiency. *Environmental Science and Pollution Research*, *29*(13), 18955–18966.

Lindenberg, N. (2014). *Definition of green finance. German Development Institute/ DeutschesInstitut für Entwicklungspolitik (DIE)*. DIE mimeo, 2014. https://papers.ssrn.Com/sol3/papers.cfm

Malerba, D., Breuer, A., & Janetschek, H. (2019). Translating sustainable development goal (SDG) interdependencies into policy advice. *Sustainability*, *11*(7), 2092.

National Institution for Transforming India. (2018). *India's 175 GW renewable energy target: NITI Aayog report*. https://www.niti.gov.in/sites/default/files/energy/175GW-Renewable-Energy.pdf

Ozili, P. K. (2022). Green finance research around the world: A review of literature. *International Journal of Green Economics*, *16*(1), 56–75.

Pattnaik, D., Kabir, M., Kumar, S., & Paul, J. (2020a). Trade credit research before and after the global financial crisis of 2008. A bibliometric overview. *Research in International Business and Finance*, *54*, 101287.

Pattnaik, D., Kumar, S., & Vashishtha, A. (2020b). Research on trade credit: A systematic review and bibliometric analysis. *Qualitative Research in Financial Markets*, *12*(4), 367–390.

Press Information Bureau, Government of India. (2021, March 23). *India ranks first among 11 countries in the renewable energy attractiveness index 2020*. https://pib.gov.in/PressReleasePage.aspx?PRID=1847813

Reddy, A. S. (2018). Green finance-financial support for sustainable development. *International Journal of Pure and Applied Mathematics*, *118*(20), 645–652.

Robinson, M. (2001). *The microfinance revolution: Sustainable finance for the poor*. World Bank Publications.

Sarangi, G. K. (2018). *Green energy finance in India: Challenges and solutions* [ADBI Working Paper No. 863].

Secretariat of the Convention on Biological Diversity. (2021). *IFC green finance: A bottom-up approach to track existing flows*. https://www.cbd.int/financial/gcf/ifcgreen-tracking.pdf

Sharma, A. (2010). Sustainable social development through innovations: Understanding Indian cases. *International Journal of Business and Globalisation*, *5*(1), 17–30.

Stern, N., & Lankes, H. P. (2022). *Collaborating and delivering on climate action through a climate club*. https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2022/10/Collaborating-and-delivering-on-climate-action-through-a-Climate-Club.pdf

Takamatsu, H., Nakajima, K., Takane, Y., Furuta, Y., &. Kikegawa, Y. (2021). Human behaviour change and its impact on urban climate: Restrictions with the G20 Osaka Summit and COVID-19 outbreak. *Urban Climate*, *35*, 100728.

Tang, D. Y. (2020). *The effects of green and social finance on firms, markets, and the economy*.

United Nations. (2022). *Progress towards the Sustainable Development Goals: Report of the Secretary-General*. https://www.un.org/sustainabledevelopment/wpcontent/uploads/2022/03/2021-Report.pdf

United States. Congress. Senate. Committee on Agriculture. (2018). Agriculture: Growing America's Economy: Hearing Before the Committee on Agriculture, Nutrition, and Forestry, United States Senate, One Hundred Twelfth Congress, First Session, February 17, 2011 (Vol. *112*, No. 275). US Government Printing Office.

Vijai, C. (2018). A study on customer's awareness on green banking initiatives in selected public and private sector banks with special reference to Cuddalore District. *International Journal of Innovative Research in Science, Engineering and Technology*, *7*(11), 9362–9367.

Wang, M., Li, X., & Wang, S. (2021). Discovering research trends and opportunities of green finance and energy policy: A data-driven scientometric analysis. *Energy Policy*, *154*, 112295.

Wang, Y., & Zhi, Q. (2016). The role of green finance in environmental protection: Two aspects of market mechanism and policies. *Energy Procedia*, *104*, 311–316.

World Bank. (2021). *World Bank Green Bond Investor Survey 2021*. https://documents1.worldbank.org/curated/en/788041573021878350/pdf/Full-Report.pdf

Wu, H., Hao, Y., & Ren, S. (2020). How do environmental regulation and environmental decentralization affect green total factor energy efficiency: Evidence from China. *Energy Economics*, *91*, 104880.

Xu, X., Chen, X., Jia, F., Brown, S., Gong, Y., & Xu, Y. (2018). Supply chain finance: A systematic literature review and bibliometric analysis. *International Journal of Production Economics*, *204*, 160–173.

Zhang, B., & Wang, Y. (2021). The effect of green finance on energy sustainable development: A case study in China. *Emerging Markets Finance and Trade*, *57*(12), 3435–3454.

Zhang, C., Wei, J., Jiang, K., Yang, Z., Yang, X., Yang, K., & Ma, C. (2021). Self-assembled micro-flowers of ultrathin Au/BiOCOOH nanosheets photocatalytic degradation of tetracycline hydrochloride and reduction of CO_2. *Chemosphere*, *283*, 131228.

Zueva, A., Niyazbekova, S., Jazykbayeva, B., Mottaeva, A., Beloussova, E., & Suleimenova, B. (2021). The Growth of 'Green' finance at the global level in the context of sustainable economic development. In E3S Web of Conferences (Vol. *244*, p. 10058). EDP Sciences.

Original Article

A Study of Payment Banks in India (With Special Reference to Paytm)

IMIB Journal of Innovation and Management
3(1) 29–41, 2025

DOI: 10.1177/ijim.241232469
jim.imibh.edu.in

Deepika Saxena[1] and Nihanshi Goyal[1]

Abstract

India began the transition to digital payments after the demonetization. The goal of digitization is to make basic financial services accessible to everybody, however, some undeserving people continue to live in remote areas outside the reach of financial services. The research looks at how newly licensed payment banks might engage with disadvantaged and migrant groups within the demographic pie to effectively achieve the inclusion goals of the Indian banking regulator. Financial inclusion is a significant step towards inclusive growth; thus, the article tries to explore how payment banks are facilitating the achievement of financial inclusion throughout the nation, with special reference to Paytm Payment Bank. The study uses descriptive and exploratory research design. The exploratory study is conducted using secondary data sources and the descriptive study is conducted using a well-structured questionnaire and statistical analysis was done to arrive at the results. Findings suggest that age, gender, occupation and educational qualification are associated with the preference to use payment banks and no association has been found between gender, age and educational qualification with the frequency of using Paytm Payment Bank. Results also reveal the positive and negative correlation between various variables. This study will assist numerous scholars and institutions in better understanding the meaning of payment banks and their role and contribution in financial inclusion.

Keywords

Payment bank, financial inclusion, digital payments, digital economy, Paytm, e-wallets

[1]Jagan Institute of Management Studies, New Delhi, Delhi, India

Corresponding author:
Nihanshi Goyal, Jagan Institute of Management Studies, New Delhi, Delhi 110085, India.
E-mail: goyalnihanshii@gmail.com

Introduction

Payments banks (PBs) in 2014 were launched by RBI, making them the first banks licensed to provide deposits (up to ₹1 lakh) and payments/remittances services, they are the first entirely unique form of bank in India. The idea of payment banks was first out in 2014 by the RBI Committee on (CCFS), in the direction of Dr Nachiket Mor. Small savings accounts and payments/remittance services are provided by PBs to 'underserved groups, including low-income households, small businesses, migratory labour workforce, and other customers'. A payment bank falls under the category of 'Scheduled Bank', however, companies must include the phrase 'payments bank' in their names to set it apart from conventional banks. The primary goal of PB is to provide banking and payment services in a safe and technologically advanced setting to migratory workers, low-income families and small businesses.

Bharti Airtel created the first PB in the country in January 2017 under the name Airtel Payments Bank to assist the government of India's projected transition to a cashless society. Besides the big names, other active Payment Banks in India include Financial Inclusion Network and Operations (FINO), NSDL, Jio, Paytm and a few others (Indian Money, 2019).

In August 2010, One97 Communications Ltd launched 'Pay via Mobile', often known as Paytm, as a website for prepaid cell phone recharging. Paytm started out as a website for phone recharges, but it has now developed into India's top online retailer. It accepts debit cards, credit cards and net banking transfers into its integrated wallet. It has grown over the last six years and is now the customers' first option among all current payment systems in India It first provided a way to recharge mobile phones, but it swiftly extended to offer options for paying for other services as well, including metro cards, DTH, data cards, electricity and water bills, as well as for flights and buses bookings. Also, it provides the choice of making purchases through its online store. It joined the M-commerce market after achieving success in the e-commerce market and now allows smaller businesses to advertise their items on its website. The first payment app in India to surpass 100 million downloads was Paytm in 2010. The next year, it introduced Paytm Gold, a service that allowed consumers to purchase pure gold online for as little as one (Hans, 2020).

RBI gave Paytm permission to start a PB in August 2015. The Paytm Payments Bank is a totally independent company in which Vijay Shekhar Sharma, the company's founder, owns 51% of it, One97 Communications owns 39% of it and a One97 subsidiary and Sharma owns the remaining 10%. The main objective of payment banks is to enhance financial inclusivity by providing limited savings accounts and payment remittance services to low-income families, migrant workers, small enterprises and other organizations.

India's banking system has undergone major and recent improvements to promote financial inclusion. Opening accounts is just one aspect of financial inclusion. It includes easy and secure access to items for micro-investments, insurance and financing. For the varied demands of our population, there is no one-size-fits-all option to achieving full financial inclusion. Years have been spent on a plan to provide financial assistance to the country's weakest regions. Now is the moment to take advantage of a framework to channel such efforts.

The adoption of payment banks is strongly influenced by individuals' perceptions and personalities. How people view payment banks, shaped by their experiences and cultural context, plays a crucial role. Those who see payment banks as secure and convenient are more likely to embrace them. Personality traits like risk tolerance and openness to innovation also impact adoption. A crucial step towards more equitable growth is financial inclusion. It assists with the overall economic development of the poor community. By offering them modern financial products and services, India's impoverished and disadvantaged people may escape poverty. This is only possible with effective financial inclusion.

Considering this, several research questions are presented, such as:\

RQ1: How payment banks are different from scheduled commercial banks?
RQ2: What is the role of payment banks in financial inclusion in India?
RQ3: What is the perception of people towards Payment Banks in India?
RQ4: Which are the prominent Payment Banks in India?
RQ5: What are the factors leading towards the usage or non-usage of payment bank services and what leads to their satisfaction level?

Given the major focus on financial inclusion in prior research, this study especially evaluates the contributions of payment banks in improving access to financial services and understanding the perception of people towards Paytm Payment Banks.

The study begins with an introduction to payment banks (first section) and then moves to the relevant literature review (second section). Research objectives and methodology are outlined in the third and fourth sections, while findings, discussion and conclusion occupy the fifth and sixth sections, respectively.

Literature Review

To get a thorough grasp of sustainable banking, it is essential to research and analyse the already available literature as well as its emerging trends and what earlier authors have revealed. This is due to the growing significance of digital financial practices in the banking industry and the increased academic attention in its various facets.

According to a study by RS and Chittawadagi (2019), the Indian government has introduced numerous digital payment methods, including UPI for smartphones, USSD-based mobile banking for basic and feature phones, BHIM app, a unified UPI app, Aadhaar Pay, which allows for the creation of cashless payments using an Aadhaar card and a fingerprint for biometric authentication, and Bharat QR Code for Cashless electronic payments to further simplify the payment process. Similarly, Goel (2015) highlighted that the payments-bank model is potentially a significant innovation that helps to expand the size and efficiency of the financial inclusion process; nevertheless, there are many challenges involved in the success of payment banks. People have a preference for cash even in urban areas where alternatives exist, the over-the-counter trap which means the customer does not have an account but uses the agent banking model, Competition from other commercial banks. Furthermore, Pramani and Iyer (2022) conducted a study that there are several reasons why payment banks have not been as successful as expected. Low knowledge, trust have been highlighted as the main reasons for poor adoption by the client categories covered here, namely, migrant labour and small merchants. These issues develop because of discrepancies between the target audience's characteristics and the business model design. Naik et al. (2018) evaluated that there are many bottlenecks that must be removed before the true advantages of payment banks can be realised, Many Indians, millions of them, lack access to financial services. They are not eligible for government assistance, loans, insurance or even savings account interest. The underbanked and unbanked will be reached via M-Banking, IPPB and PMJDY in all societal and geographic segments. A study by Sarkar and Singh (2019) revealed that the Demonetization of currency in 2016 significantly altered how individuals spend their money. Additionally, it has transformed banking services. The payments have become easier as one now does not have to worry about cash as they can easily make payments through Paytm, Tez, Credit Card, Debit Card, etc. Now even schools and colleges have started collecting their fees through these digital transaction methods which have totally revolutionised the way of money transferring. These digital platforms have also decreased illegal money transfers as most of these platforms are directly linked with the bank, through Aadhar Cards or PAN Cards and thus they have complete information about the customers. Kaur et al. (2020) highlighted that today's kids are more technologically sophisticated compared to persons over 40 years old, it has been found that those with greater incomes are more productive than those with lower incomes. This is possible because of the higher income group's hectic schedules and limited time for branch visits. Additionally, they have enough money to purchase the newest cell phones with Internet capabilities so they may do banking transactions whenever necessary. As a result, people choose mobile banking as their favourite method of doing financial operations. Similarly, Mittal et al. (2017) pointed out that although factors like gender, qualification and employment all affect the customer's decision to use a payment bank, the comfort or convenience of technology has a positive impact on the usage of payment banks. Even though consumers still favour universal banks for savings, additional research reveals that they are frequently using payment banks for mobile phone bill payments. However, the payment institutions may influence the clients' mindset by properly promoting and raising their awareness. Yet another study by Sikdar and Kumar (2016) highlighted that to stay competitive both established commercial banks and emerging competitors must form strategic alliances with firms that have extensive retail outlets and agent networks. The decade of 2020 was anticipated to be a symbol of 'bank on the unbanked', with the new players opening the door for the realization of the long-cherished ambition of inclusive growth and including the hitherto excluded demographic. Mehta and Singla (2021) revealed that Paytm has advanced to provide a broad variety of services before reaching its zenith and becoming a standalone payment bank. Yet another study by Vikas and Kumar (2018) on the Paytm app offers advantages and disadvantages. One set of users claimed that the Paytm app is free and simple to use. The opposing side believed that Paytm had connectivity concerns, meaning that it could not connect without an internet connection. Burhan et al. (2020) highlighted the factors of phone banking with expanded Technology Acceptance Model (TAM) as the foundation. Although perceived security risk has been demonstrated as statistically insignificant, perceived value is considered to be significant in understanding the adoption of m-banking by users. m-banking adoption is negatively impacted by service pricing, a country-specific variable, but easy accessibility has been found to have the most beneficial impact in the context of Bangladesh. Another study by Gupta et al. (2020) investigated the TAM-based customer behavioural intents while adopting fintech services. The results show that views about utilizing fintech services are highly influenced by brand and service trust. Additionally, perceived utility and simplicity of use have a very beneficial impact on attitudes. The employment of modern ICT technology has exponentially reduced the burden on financial operations and services. Thathsarani and Jianguo (2022) revealed digital finance role as a mediator between financial inclusion and SME success, as well as how the TAM promotes both. TAM, digital finance and financial inclusion all have an impact on how well small and midsize businesses operate. More particular, digital finance and TAM favourably influence the relationship between financial inclusion and performance in SMEs.

Research Objectives

In the view of above research questions and Literature Review, the following objectives are formulated. First, the study aims to identify the role played by payment banks in promoting financial inclusion in India. Second, it seeks to understand the perceptions of individuals regarding Paytm Payment Bank. Third, the study intends to identify the factors that influence customer satisfaction levels when using Paytm Payment Bank. Lastly, it aims to determine the factors affecting the usage of services provided by Paytm Payment Bank. These objectives provide a structured approach to examining the role of payment banks, with a particular focus on Paytm Payment Bank, in the context of financial inclusion and customer behaviour in India.

Research Methodology

The exploratory study relies on secondary data sources, which encompass publications in national and international journals, magazines and papers, as well as research conducted by organizations such as Deloitte, KPMG, Forbes, McKinsey and others. With the use of a structured questionnaire, descriptive research was carried out. Purposive sampling was employed for gathering data from a sample of 250 respondents with access to mobile phones. Out of the total responses, 240 responses were fit for the study. The respondents were split into categories based on several criteria, including gender, age, employment, frequency and purpose of usage. The data analysis was done using the statistical software SPSS (Statistical Package for Social Sciences), chi-square and Bivariate correlation analyses were conducted on the data to arrive at the results. Cronbach's alpha is a simple test to determine the reliability, internal consistency or value given. 0.70 is considered good. In this article, the value of Cronbach's alpha is 0.793 which is good and reliable.

The article seeks to substantiate the above statement by examining the impact of age, gender, qualification, and employment on the use of services provided by payment banks.

H_{1a}: There is an association between gender and preference to use services provided by Paytm Payment Bank.
H_{1b}: There is an association between gender and satisfaction level of various services provided by the Paytm Payment Bank.
H_{1c}: There is an association between gender and frequency of using Paytm/Paytm Payment Bank.
H_{1d}: There is an association between gender and difficulty level of using Paytm Payment Bank.
H_{2a}: There is an association between age and frequency of using Paytm/Paytm Payment Bank.
H_{2b}: There is an association between age and the difficulty level of using Paytm Payment Bank.
H_{2c}: There is an association between age and preference to use services provided by Paytm Payment Bank.
H_{2d}: There is an association between age and satisfaction level of various services provided by the Paytm Payment Bank.
H_{3a}: There is an association between occupation and the preference to use services provided by Paytm.
H_{3b}: There is an association relation between occupation and the difficulty level of using Paytm.
H_{3c}: There is an association between occupation and satisfaction level of various services provided by the Paytm Payment Bank.
H_{3d}: There is an association between occupation and frequency of using Paytm/Paytm Payment Bank.
H_{4a}: There is an association between education qualification and the preference to use services provided by Paytm.
H_{4b}: There is an association between education qualification and the frequency of using Paytm.
H_{4c}: There is an association between education qualification and the difficulty level of using Paytm.
H_{4d}: There is an association between education qualification and satisfaction level of various services provided by the Paytm Payment Bank.

Results and Discussion

Introduction to Payment Banks and Their Role Towards Financial Inclusion in India

A new kind of bank developed by RBI is a payment bank. These banks are only permitted to take a maximum deposit of 100,000 per client, with the possibility of an increment. These banks can provide services like net banking, ATM cards, debit banks and mobile banking but they cannot make loans or dispense credit cards. PBs' primary objective is to advance financial inclusion by offering small savings accounts and payments and remittance services to migrant workers, low-income households, small businesses and other users. This is achieved by enabling high volume, low-value payments and remittance services transactions in a secure, cutting-edge setting.

There are no substantial credit or market concerns for the PB. The payment bank's paid-up equity capital must be at least ₹ 100 crores. Subject to any greater percentage that RBI may occasionally impose, the bank must maintain a minimum capital of 15% calculated based on its risk-weighted assets (RWA). At least 7.5% of RWAs should go to Tier I capital. At least 100% of all Tier I capital should go to Tier II. For the first time, the RBI is now granting unique licenses for specific businesses, and this move is seen as an important step towards advancing financial inclusion in the country.

It is a path towards redefining banking in India. The Reserve Bank anticipates that payment banks will offer low-cost savings accounts to small enterprises, rural households and migratory workers in India. PBs are intended to help less fortunate people who now solely use cash enter the formal banking system. Traditional banks could find it unprofitable to establish branches in every community, but the widespread use of mobile phones offers a potential, low-cost platform for swiftly bringing essential financial services to every rural resident. The development is anticipated to enhance India's transition to a cashless society.

The domestic remittance business in India is thought to be worth between ₹ 800–900 billion and rising. With the ability to send money via mobile devices, a sizable portion of it—particularly that of the migratory workforce—could switch to this new platform. Payment banks may also be used to conduct the government's direct benefit transfer program, which deposits government subsidies for gas, healthcare and education directly into beneficiaries' accounts.

Various Payment Banks Operating in India

Several entities were given approval by the RBI to conduct activities and other businesses that banking corporations may participate in, as defined, and detailed under the Banking Regulation Act, 1949, accordingly. The payment banks that are active in India are as follows:

Airtel Payments Bank Ltd: Eleven businesses received in-principal approval to create payment banks from the Reserve Bank of India in 2015, in accordance with the rules for licensing payment banks. Airtel was one of them, and in September 2016 it launched Airtel Payments Bank. The Rajasthan-based pilot program for Airtel's first PB began in November 2016. In order to contribute to the government of India's promised cashless revolution, the largest telecom business in the country, Bharti Airtel, launched Airtel Payments Bank in January 2017.

Jio Payments Bank Ltd: Reliance Industries owns Jio Payments Bank, an Indian payments institution that debuted in 2018. It joined forces with the State Bank of India to create Jio Payments Bank Limited in November 2016. It is a 30:70 joint venture between the two.

India Post Payments Bank Ltd: This is wholly owned by the Indian government. On 1 September 2018, Prime Minister Shri Narendra Modi introduced IPPB. The bank was established with the intention of being India's most approachable, affordable and trustworthy financial institution. By utilizing 160,000 post offices (145,000 of which are in rural areas) and 400,000 postal workers, IPPB's main objective is to remove barriers for individuals who are underbanked and unbanked and to cover the last mile.

FINO Payments Bank Ltd: On 30 March 2017, FINO got the RBI's final clearance to operate as a PB. The bank provides various services to the rural poor. FINO Payments Bank has an asset-light business model and provides a variety of financial goods and services with a focus on payments that are predominantly digital. Moreover, the bank is primarily reliant on fee and commission-based revenue from its merchant network and key commercial alliances.

Paytm Payments Bank Ltd: PPBL, an Indian PB with its main office in Noida, was established in 2015. The company wants to connect half a billion Indians into the global economy through payments, commerce, banking and other services. With 500 million customers, Paytm Payments Bank wants to become the largest digital bank in the world, offering everything from credit cards and stock market trading to wealth management.

NSDL Payments Bank Limited: With effect from October 29, 2018, National Securities Depository Limited began operating as a PB to aid the effort to offer streamlined financial services to every Indian. Since then, the bank has been offering services for creating and maintaining individual clients' savings accounts as well as launching its Android mobile application, NSDL Jiffy.

People Perception Towards Paytm Payment Bank

First, this section includes the demographic profile belonging to the 240 people forming the sample.

As can be seen in Table 1, 240 people participated in the research. A total of 93 participants are females and 147 are males. A total of 185 participants in the sampling group are between 18 and 30, 23 participants are between 30 and 45, 24 participants are between 45 and 60 and 8 participants are above 60 years of age. A total of 111 participants are service professionals, 73 participants are self-employed and 56 participants are not working. A total of 13 participants are in intermediate, 74 participants are graduates, 130 are post-graduates, 21 of them have professional degrees and 2 are having some other degree.

Table 1. Properties of Sampling Group.

Variable	Groups	*n*	%
Gender	Female	93	38.7
	Male	147	61.25
Age	18–30	185	77
	30–45	23	9.5
	45–60	24	10
	Above 60	8	3.3
Occupation	Service	111	46.7
	Self-employed	73	30
	Non-working	56	23.3
Education	Intermediate	13	5.4
Qualification	Graduation	74	30.8
	Post-graduation	130	54.1
	Professional	21	8.75
	others	2	0.83

To examine the association between the categorical variables, the chi-square test is used. H1 is there exists a relation between gender and preference to use services provided by Paytm Payment Bank. The test result indicates the p value to be .460 which is greater than 0.05 so we accept the null hypothesis. Hence H_{1a} is supported and the hypothesis is accepted that there exists a relation between gender and preference to use services provided by Paytm Payment Bank. Similarly, H_{1b}, H_{1d}, H_{2b}, H_{2c}, H_{2d}, H_{3a}, H_{3b}, H_{3c}, H_{3d}, H_{4a}, H_{4c} and H_{4d} are also supported as the p value is greater than .05. Hypothesis H_{1c}, H_{2a} and H_{4b} are having p value .000 which is lesser than the value of .05. The null hypothesis is rejected, and we adopt the alternative hypothesis that there is no correlation between gender and the frequency of utilizing Paytm Payment Bank. Furthermore, there is no correlation between age and the frequency of using Paytm Payment Bank and between education qualification and the frequency of using Paytm.

Overall, 91% of respondents said that they will recommend Paytm Payment Banks to their friends, family and associates and only 9% of respondents said that they are not happy with the services provided, hence they will not recommend it further to their friends, family and associates.

It can be observed that people mostly use Paytm for UPI for the purpose of making payments, followed by the Paytm wallet. Most of people did not prefer to use Paytm Bank for any purpose even when they are being offered high-interest rates.

Table 2. Hypothesis with their *p*-values.

S. No.	Hypothesis	*p* Value
H_{1a}	There is an association between gender and preference to use of services provided by Paytm Payment Bank.	.460
H_{1b}	There is an association between gender and satisfaction level of various services provided by the Paytm Payment Bank.	.558
H_{1c}	There is an association between gender and the frequency of using Paytm/Paytm Payment Bank.	.003
H_{1d}	There is an association between gender and difficulty level of using Paytm Payment Bank.	.614
H_{2a}	There is an association between age and frequency of Using Paytm/ Paytm Payment Bank.	.000
H_{2b}	There is an association between age and the difficulty level to use Paytm Payment Bank.	.270
H_{2c}	There is an association between age and preference to use services provided by Paytm Payment Bank.	.088
H_{2d}	There is an association between age and satisfaction level of various services provided by the Paytm Payment Bank.	.995
H_{3a}	There is an association between occupation and the preference to use services provided by Paytm.	.636
H_{3b}	There is an association between occupation and the difficulty level of using Paytm.	.346
H_{3c}	There is an association between occupation and satisfaction level of various services provided by the Paytm Payment Bank.	.338
H_{3d}	There is an association between occupation and frequency of Using Paytm/Paytm Payment Bank.	.099
H_{4a}	There is an association between education qualifications and the preference to use services provided by Paytm.	.623
H_{4b}	There is an association between education qualifications and the frequency of using Paytm.	.000
H_{4c}	There is an association between education qualification and difficulty level of using Paytm.	.132
H_{4d}	There is an association between education qualifications and satisfaction level of various services provided by Paytm Payment.	.491

Factors Affecting Satisfaction Level While Using Paytm Payment Bank

Ease of use: It is about making things easy. It is generally believed that technology is considered user-friendly when an individual can use it effortlessly and without much exertion. The simplicity in the usage is a key factor in attracting women and elderly users. With the ease in using technology, individuals are more inclined to use financial services.

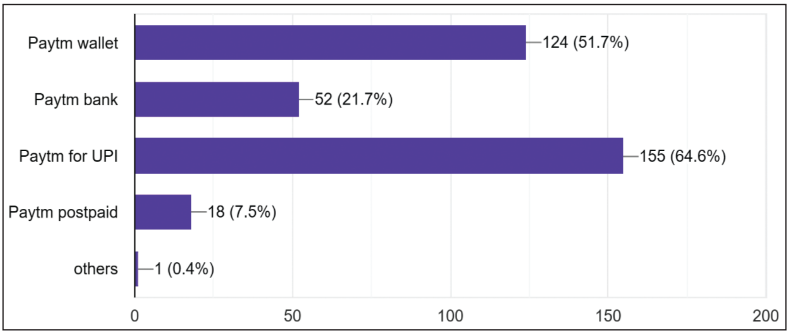

Figure 1. Preferred Mode of Payment While Using Paytm.

Ease of learning: If an individual is confused about managing a service, they are always hesitant to use it. Customers that are not technology proficient have issues with technology. Therefore, banks must provide a user interface that is simple for clients to use. In addition to being simple to use, the interface should also benefit the user.

Responsiveness of service: Responding to clients' questions and issues in a timely manner can help to win their trust. Since it offers financial services to everyone, the financial sector is mainly a people-focused enterprise. Since all the services offered by banks are focused on meeting the demands of their customers, they must run smoothly. The fastest possible reaction time while serving a client will assist the bank gain their confidence and keep them as customers, which will increase the bank's profitability.

Security: For users, every financial transaction or information is extremely sensitive. Therefore, before implementing any financial technology, a consumer values security as one of the key aspects. To make online banking safe, efficient techniques and procedures are needed. The technology employed should be both practical and safe to use. The trust of individuals and the reputation of Internet banking will both benefit from such security and privacy.

Trust: In essence, trust is used to measure the level of risk involved in financial transactions, meaning that it directly relates to consumer satisfaction. As trust grows, users' perspective of mobile payments also increases.

Reference group influence: An individual lives in a social setting and is significantly influenced by those around him. If his reference group uses the same financial service, the consumer is far more likely to utilise it with confidence.

To understand whether the ease of use derives satisfaction or not which further impacts the frequency of usage, a bivariate correlation study was performed to demonstrate the relationship between these variables. The obtained findings are as follows:

The findings of correlation analysis proved there is a negative relation between the difficulty level and satisfaction derived from using Paytm Payment Banks because when people find something difficult to use, they do not feel happy and satisfied with it which in turn stops them from using it again. There is a positive relation between satisfaction level and frequency of using Paytm Payment Bank

Table 3. Correlation Between various variables

S. No.	Statement	*R* Value
1	Relation between difficulty and the satisfaction level of using Paytm Payment Bank.	−0.111
2	Relation between satisfaction level and frequency of using Paytm Payment Bank.	0.278
3	Relation between difficulty and preference of using Paytm Payment Bank	−0.259
4	Relation between preference and frequency of using Paytm Payment Bank	0.323

because when people are satisfied with the services, they are using it again and again. It further reveals that there is a negative relation between difficulty and preference of using Paytm Payment Bank and a positive relation between preference and frequency of using Paytm Payment Bank.

Conclusion

Payment methods have gone through an evolutionary progression, starting with cash and moving on to online payment applications like Google Pay, PhonePe and Paytm, and finally to e-commerce and phone banking nowadays. The article tries to understand people perception of payment banks. It suggests that age, gender, occupation and educational qualification have a direct relation with the preference to use payment banks. Additionally, the technology's ease has a favourable effect on both the frequency and degree of satisfaction when accessing payment banks. However, the user still prefers universal banks for savings but often chooses payment banks for services like phone recharge and payment services. Customers' mindsets may be altered with the right advertising and education from payment banks. Since the RBI has placed several constraints on payment banks' ability to conduct business, removing some of those regulations might increase their level of competition.

Acknowledgement

The authors express their gratitude for the valuable input provided by the anonymous reviewers, whose insightful suggestions have enhanced the methodology and findings of the work.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding

The authors received no financial support for the research, authorship and/or publication of this article.

References

Gupta, A., & Singhal, R. (2021). Impact of COVID-19 on digital payment services at towns and villages. IJCRT2106045 *International Journal of Creative Research Thoughts (IJCRT)*.

Gupta, K. P., Manrai, R., & Goel, U. (2021). Analysing the factors that affect the adoption of payments bank services in India: An analytic hierarchy process approach. *International Journal of Business Information Systems, 37*(4), 522–543.

Kaur, J., Kaur, S., Syan, A. S., & Sharma, R. R. (2020). Factors influencing the adoption of payment banks in India using an extended TAM. *Asia-Pacific Journal of Management Research and Innovation*, *16*(4), 309–321.

Kittu, R. S., & Chittawadagi, S. M. B. (2019). Role of Payment Banks in Digital Payments-A Case Study of Paytm. *Emperor International Journal of Finance and Management Research Received, 5*(1), 52–57.

Mehta, P., & Singla, H. (2021). From rags to riches: a case study of Paytm's inspiring journey from a mobile recharge website to a payments bank. *International Journal of Indian Culture and Business Management, 22*(4), 519–557.

Mittal, S., Pant, A., & Bhadauria, S. S. (2017). An empirical study on customer preference towards payment banks over universal banks in Delhi NCR. *Procedia Computer Science*, *122*, 463–470.

Naik, V. R., Firdous, P., & Harika, P. (2018). *A study on role of payment banks in India—financial inclusion* [Paper presentation]. The 5th international conference on recent advances in engineering, science, and management YMCA, Connaught Place, New Delhi (India).

Pramani, R., & Iyer, S. V. (2022). Adoption of payments banks: A grounded theory approach. *Journal of Financial Services Marketing*, *1*(1), 1–22.

Sarkar, S., & Singh, S. (2019). A critical study of payments banks in India. *SSRN Electronic Journal*.

Sikdar, P., & Kumar, A. (2016). Payment bank: A catalyst for financial inclusion. *Asia-Pacific Journal of Management Research and Innovation*, *12*(3–4), 226–231.

Thathsarani, U. S., & Jianguo, W. (2022). Do digital finance and the technology acceptance model strengthen financial inclusion and SME performance? *Information*, *13*(8), 390.

Vikas, D., & Kumar, A. A. (2018). What Indians Think About Paytm. *World Scientific News, (110)*, 184–196.

Hans. (2020, March 12). The growth of Paytm. *The Hans India*. https://www.thehansindia.com/hans/young-hans/the-growth-of-paytm-611171

Indian Money. (2019, January 25). Payment banking in India. *Indian Money*. https://indianmoney.com/articles/payment-banking-in-india

Original Article

Status Quo of Artificial Intelligence's Role in the HRM Operations

IMIB Journal of Innovation and Management
3(1) 42–57, 2025

DOI: 10.1177/ijim.241247423
jim.imibh.edu.in

Mohsin Khan[1] and P. V. Vijay Kumar Reddy[1]

Abstract

Coexistence of technology and business dates back to the late 18th century when the first ever use of a computer was for recording the census by the US government in 1890. The use of technology in business can be ascribed to different organisations in the different nations on the parallel lines of time. It includes invention of cash machines and their use by Barclays in England in the early 1960s, the induction of telephone-based modems for order management by Baxter Pharmaceuticals and use of small desktop computing device called Minitel for processing customer orders in France were the other notable developments in the history of coexistence of technology and business. Increasing operations in the business functions have created an urge for the technological innovation in the industry to handle the operations electronically. Figueiredo and Cohen (2019) say that technology has become an indispensable component of every business function by delivering ease in operations and productivity. The end of the 20th century had witnessed the leaping progress in computing in the form of artificial intelligence (AI) performing the tasks that were unimaginable to comprehend a decade back in time. Developments in the technological research and development prove that organisations have started inducting AI into as many fields as possible at a considerable pace. As a part of the shifting technological dynamics in the industry HR function has also transformed digitally. Tools like enterprise applications have forayed intensely into the operations of human resources management (HRM). These enterprise resource planning (ERP) tools remain to primarily serve the integration of HRM to the other

[1]Institute of Public Enterprise, Hyderabad, Telangana, India

Corresponding author:
Mohsin Khan, Institute of Public Enterprise, Survey No. 1266, Shamirpet (V&M), Medchal, Hyderabad, Telangana 500101, India.
E-mail: mohsinkhan1118@gmail.com

functions. However, enterprise tools could not serve the purpose of supporting decisiveness in the areas of HR planning, workforce design and performance management at large. However, Tuck (2019) argues that AI is assuming increased responsibilities in the different sections of the society and business including the HRM function. At present, the amount of knowledge on the status quo of the role of AI in the HRM functions is scarcely available. Literature related to this disruptive technology in the HR function is still at the nascent stage. This study will examine the role of AI as a key component in the HRM function, which is regarded to be highly human-driven.

Keywords

Human resources management, artificial intelligence, digital selection and recruitment, automation in performance management, intelligent systems

Introduction

Organisations across different sectors had experienced the advent of technology in each function among which, artificial intelligence (AI) is regarded as the disruptive technological development (Faix, 2022; Kong et al., 2021). Also, Prakash et al. (2022) had confirmed that the progress in technology not only changed the way organisations operate but it also disrupted the conventional way of work and lifestyles. According to Almeida (2022), disruptive technology refers to the advancement in the science and technology that leads to the fundamental restructuring of existing methods. AI is defined as a complex machine learning application that has a data processing approach such as deep neural networks, simple algorithms relying on regression analyses, natural language processing or voice recognition (Hunkenschroer & Luetge, 2022). Since AI is an emerging concept the definition of AI lies within the scope of the tasks it currently handles. AI is an emerging concept, and its abilities and futuristic tasks would modify the present definitions used to describe AI (Kaplan & Haenlein, 2019; Yarger et al., 2020). Technological advancements in data management have become an essential part of every business with the ability to measure productivity, efficiency and operational excellence (Minbaeva, 2021). Currently the data management for the multi-utilitarian reasons in business is assisted by the existing tools that have become the preform of the developments in AI research. However, the role of AI in the business management is considered novel and in a nascent stage on the timeline of technological evolution. Implementation of AI in the primary activities of business did not assume the full scale yet. This could be due to the organisations technological needs met by the technologies that have intense human intervention. Confirming this Fountaine et al. (2019) say that many companies limit AI to secondary projects and struggle to scale up the use of AI in their regular and key activities. AI can be often seen implemented in the areas, viz. virtual merchandising, experiential marketing, customer experience management and supporting the expert systems. Abdeldayem and Aldulaimi (2020) say that AI is still believed to be at the modest pace in blending with the human resource management (HRM) operations. Nevertheless, the growing use of intelligent systems in HRM at the different layers of organisation structure is seen in several organisations in some way. This growth is modest due to several technical and behavioural reasons that prevail among the HR personnel and departments. However, research and experimentation related to the HR related AI tools is widely happening (Abdeldayem & Aldulaimi, 2020; Fountaine et al., 2019). To discuss AI concept in detail, this paper followed the sequence covering the objectives of the study, methodology adapted for the study and review of literature that includes subsections discussing the evolution of AI, AI and business and AI in HRM and sub-functions. The next section in the review of literature is the existent and emerging AI tools in HRM functions. The following sections include conclusion, managerial implications, limitations and further scope. Setting this as the context, this study works on the below objectives.

Objectives

To study the evolution of AI. This paper would try to study the origins of AI and track its evolution over the decades.

To study the adaptation of AI into the key business functions. While the technological advancements have changed the distinct functions of business, the status of the adaptation of AI in such functions has not been widely reviewed yet. Considering these, this study will explore the adaptation of AI among the organisations.

To study the role of AI in HRM and its sub-function. With the specific interest to explore the role of AI in the HRM activities, this study investigates the AI's impacting role in HRM operations.

To study the application of AI tools in the HR function. Studying the emerging AI tools and technologies in the field of HR is another objective of this study.

Methodology

A conceptual method is adapted to study the selected subject extensively. Research and implementation of AI are studied form the secondary data from the authentic sources. To find pertinent publications, Boolean operators and keywords relating to AI's involvement in HRM functions were used to search academic databases, such as PubMed, Google Scholar and relevant journal archives. Predetermined inclusion criteria, such as publication date (not prior to 2000, except a few articles that were related to the theories), academic credibility and relevance to the research topic (AI and HRM), were used to pick articles and sources. Critical analysis was employed to assess the literature's reliability and applicability, with a focus on finding recurring themes, patterns and contradictions in the context of AI's role in HRM functions. The synthesis of the data was used to derive broad conclusions and insights that served as the foundation for this paper. This helps in developing the knowledge on AI and HRM from both the academic research and the industry.

Review of Literature

Evolution of AI

AI was defined in different types based on the research objectives and the technological purpose that AI was developed for (Palos-Sánchez et al., 2022; Welsh, 2019). McCarthy (1956) and Minsky (1968) stated that AI is the science of creating intelligent machines that can imitate the humans with precision. Later studies have agreed that AI is the technology that makes machines become self-learners and possess the cognitive abilities of the human being (Paesano, 2021; Palos-Sánchez et al., 2022; Tambe et al., 2019). Cox and Mazumdar (2022) confirm this by reiterating that AI is a tool that has the ability to perform the tasks that humans normally do. Several scholars in the past had contradicting opinions on how AI could replace the role of humans in decision-making. Few scholars and scientists have strongly believed that technology would take over the decision areas, while others believed that technology could only leverage the human decision-making process but would not replace the human mind entirely (Russell, 2021). In spite of the conflicting opinions of the stakeholders, data processing and predicational abilities of systems have dramatically multiplied in the last two decades.

The beginning of AI could be dated back to 1960 when researchers in the computer science and mathematical logicians had developed methods for data assertions and algorithms for data inferences (Russell, 2021). Since then, AI had started assuming the role in the automation of manufacturing and operations management not widely though.

In the 1980s, AI researchers had started empowering AI in dealing the uncertainties in real-time tasks by acquiring human thinking abilities which is later called as machine learning (Pearl, 1988; Russell, 2021). During the 1980s computers also have started learning from the experience, a technique called 'deep learning', which was popularised by the John Hopfield and David Rumelhart (Anohya, 2017). The further developments till 1990s in the AI can be asserted by the govt of Japan, which invested heftily in researching expert systems, system processing, logic programming and other AI-based technologies.

After the failure of the Fifth Generation Computer Project in meeting its commercial objectives in the early 1980s, concerned individual scholars and the engineers shifted their research area to explore AI extensively (Anohya, 2017). In the later years, AI could be seen being involved in key functions, such as manufacturing, customer experience management, big data analytics and other key business functions.

AI and Business

Coexistence of AI and business could be seen from the late years of the 19th century. AI had forayed into the most industries lately by making its mark on different business functions (Zhang et al., 2016). AI-based technological tools and applications started assuming the key roles in managing the backend operations of

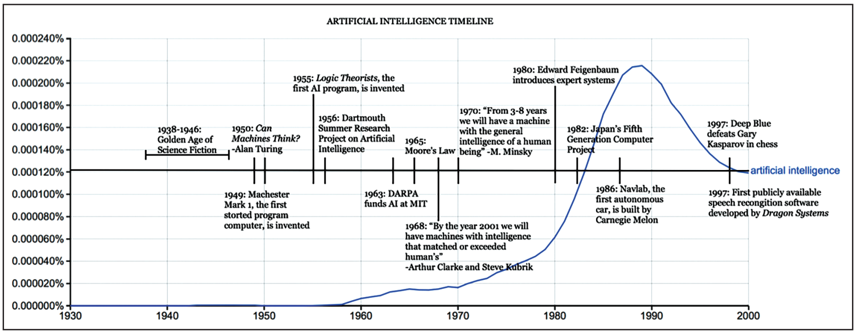

Figure 1. AI Timeline: 1970–2000.

Source: Anohya (2017).

the business while delivering the customer experience at the frontend (Karimi et al., 2009). Palos-Sánchez et al. (2022) say that the developments AI-based technologies have taken the new dimension in organisational excellence by enabling speed and precision in the decision-making. AI tools have helped organisations to concentrate on value-centric activities across all functions by extenuating the mundane tasks from the routines of the managers. For instance, HR managers could evaluate an applicant based on the data extracted by AI tools from social presence of the candidates they hire. Also, employees' performance could be evaluated and managed without spending much time on the manual processing. Tools like IBM Watson help the managers to handle such routine tasks effectively (Palos-Sánchez et al., 2022). Customer service in marketing function has become real time by providing online support and suggestions with the help of predictive analytical capabilities that AI had added to the (CRM) systems (Chen et al., 2012). Supply chain operations are disrupted due to the contingencies and the irregularities involved in the business. This leads to delays in the material flow, failed fulfilment of orders and challenges in the stock management. Implementation of AI in the supply chain operations had addressed these challenges by efficient management of data and making the supply chain functions proactive (Bodendorf & Zimmermann, 2005). Also, other back-end operations of the business such as resource planning, warehouse management and logistics are effectively optimised, resulting the cost savings on the overheads (Karimi et al., 2009). Apart from its implementation in the business, AI applications also have assumed an important role in making weaponry more autonomous and deadly in the defence sector (Heller, 2019). Unmanned aircraft and drones, machine-learning solutions targeting the specific tasks and autonomous intelligent radar systems, etc., are the few examples.

AI in HRM and the Sub-functions

Kim et al. (2015) state that ability, motivation and opportunity (AMO theory) effect the HR personnel in delivering the best possible results by effectively handling all HR tasks and practices. Minbaeva (2021) concurs with this and states that disruptive technological advancements have become essential in managing organisations and HR tasks. Kaur et al. (2021) predict that the use of intelligent systems will become indispensable in the near future of HRM operations, though the present pace of research in the AI and HRM is considerably low. This section discusses how technology and intelligent systems have discovered innovative ways of performing the tasks in the below different sub-functions of human resources management:

- AI and HR planning and workforce design
- AI's role in digital selection and recruitment
- AI in performance management
- Implementation of AI in training and development

AI and HR Planning and Workforce Design

HR planning and workforce design is a strategic practice that takes the leverage of data analytics to make resource optimisation recommendations for the organisational development (Doll, 2022). Predicting the requirement and planning to balance the hiring with the optimised cost is the key essential for effective HR planning and workforce design (Kurniawaty & Rosyadi, 2022). The growing organisational activity and the subsequent need to cut the costs throw challenges to the HR for effective hiring. Effectiveness in hiring and employee engagement lead to the productivity, whereas failing to recruit people with the appropriate competencies will lead to business failure (Čanković, 2015). Technological advancements in the business had given advantage to the HR managers to assess the candidates even before the personal interaction happens. For instance, the online social presence of the individuals had enabled the HR to conduct the social media screening with the help of data posted by the candidates on their social media pages (Jeske & Shultz, 2016). However other earlier studies have expressed concern about the reliability of the information provided by the candidates on the internet (Davison et al., 2011; Bentley, 2013). Amidst all the speculations about the impact of technology on HR planning and workforce design, intelligent systems had started their course of action. AI-based tools are helping HR executives in making strategic decisions related to the planning and workforce design. AI tools have been implemented in sorting the multitudes of the job applications received, assessing the gestures of the candidates during the online interviews, and updating the applicants of their hiring status. This had helped the HR function to reduce the grunt work on HR personnel (Zielinski, 2017). A San Francisco based HR tech company FirstJob had created an AI tool 'Mya', which works as an HR assistant to answer varied queries of the candidates on organisation policies, benefits and the organisational culture (Zielinski, 2017). Intelligent applications of this kind have trimmed off the non-value-added tasks from the activities of the HR personnel. Another tool that is in the testing phase is X.ai, which, if successfully launched, could be deployed in the interview scheduling and calendar management of the HR executives.

IBM Watson adds new competencies to the HR as an intelligent talent management tool. It enables HR to the social media listening for understanding the aspirant insights, provides predictive analytics on the success probability of the candidates and prioritises the positions to be filled by performing the requirement analysis fed in the HR systems (Feuss, 2015; Maity, 2019; Zielinski, 2017). While such intelligent reflexes have been performed by AI applications, several HR and technology experts still opine that AI tools have a risk of failing due to the patterns they have learnt from the historical data and inadvertently ignored the recent developments which are important and sensitive to factor in. Implementation of AI tools in the real-time selection tasks of HR had been initiated in the global companies like Unilever, Amazon, Proctor & Gamble, etc. Also, SAP claims that its clients like Standard Charted, Microsoft, Whirlpool Corporation, etc., have been impacted immensely with their HR analytics and workforce planning application.

AI's Role in Digital Selection and Recruitment

Challenges involved in finding the competent candidates can be addressed by the advancements and innovations in technology. Mehrotra and Khanna (2022) describe that AI helps recruiters to identify, screen, assess and select the right candidates. This helps in creating a significant talent pool for the organisation. This is done by automation of workflow, eliminating the repetitive high-volume tasks with reduced turnaround time and cost. Companies are extensively deploying AI tools in their selection and the recruitment process to increase the pace and efficiency of operations (Hunkenschroer & Luetge, 2022). *People Management* (2023) reports of Amelia, which is a virtual HR agent, a quick learner, multilinguist and manages multiple tasks efficiently. This tool was developed by IPSoft who is expecting that eventually Amelia will be responsible for all the recruitment related tasks. The selection and recruitment process are becoming complex with the increasing number of applications and the complex parameters to shortlist the candidates. Intelligent tools like Amelia are helping HR in sorting and managing the information efficiently. Agreeing to this, Rąb-Kettler and Lehnervp (2019) argue that the adaption of technology in the selection and recruitment process gives the best experience to the recruiter and candidates participating in the process. Interestingly the AI-based systems had gone to the extent of decerning the candidates' personal details, viz. age, gender, confidence levels and the chances of selection through the voice and image recognition systems (Dattner et al., 2019; Oswald et al., 2020; Simbeck, 2019). However, few scholars have argued that intense use of intelligent systems that provide too many personal details of the candidates may cause biased opinions among the selectors (Fernández-Martínez & Fernández, 2020). Screening algorithms have been a part of the selection process, which would ask the candidates a set of predetermined questions during structured interviews. AI-based systems not only evaluate the responses but also assess the expressions, emotions and the body language of the candidates using audio and facial recognition tools (Chamorro-Premuzic et al., 2016; Fernández-Martínez & Fernández, 2020; Köchling et al., 2021; Tambe et al., 2019). Despite the benefits that AI provides in the selection process HR has to handle several other challenges pertaining to the use of technology. First, data literacy of the hiring managers is essential in using the AI tools effectively as the results have a massive impact on the applied candidates (Fernández-Martínez & Fernández, 2020; Hunkenschroer & Luetge, 2022; Simbeck, 2019). Second, the programmers developing the algorithm must understand the business processes and the standards that hiring organisations follow for assessing the applicants. Failing to comprehend such requirements while developing the tools may incapacitate the tools from doing the job it is meant for (Hunkenschroer & Luetge, 2022; Oswald et al., 2020). Third, factoring in the important ethical factors is a greater challenge when the human minds are prone to follow the old patterns and beliefs with the excess amount of data available. For instance, to overcome the ethical issues some AI companies have removed the code that identifies the CVs on the basis of gender to mitigate the unconscious bias among the selectors (Hunkenschroer & Luetge, 2022; Yarger et al., 2020). Mehrotra and Khanna (2022) had seen a significant impact of the AI recruitment tools on the experience of the HR personnel and candidates. Such tools are widely used in the organisation multinational firms like IBM, Earnst and Young, Infosys, L'Oréal, Unilever, Bajaj Allianz, and Mindtree (Mehrotra & Khanna, 2022). Also, a few HR start-ups, namely HireVue, Pymetric, Para.ai, Hiretual and Darwinbox, have started implementing the AI tool in the selection process. If HR could integrate with the programmers in developing the tools, AI applications could become the most reliable technology for selection and recruitment in the future.

AI in Performance Management

Performance management effectiveness is the alignment between the organisational goals and the individuals employed (Awan et al., 2020). The basic purpose of performance management systems (PMS) is to help the managers in decision-making by ensuring the right information is accessible to them as the decision inputs (Sahlin & Angelis, 2019). As a part of the technological evolution data-driven management is adapted widely that is called algorithmic-management, which helps organisations in automating the tasks and processes (Sahlin & Angelis, 2019; Schildt, 2017). In this context, performance management tools developed in recent years have proved to drive the HR interface through the conventional realm. Buck and Morrow (2018) argue that performance management is not a one-time activity but rather a continuous data-driven conversation that requires more touch points and the real-time information management to give the employees the transparent and constructive feedback they deserve. Wang (2021) says that managing the objectives and key results (OKRs) and key performance indicators (KPIs) have reached almost precision in quantification with the implementation of technology. With their ability in collecting, processing and analysing the voluminous data AI tools have brought the new efficiencies in the PMS (Wang, 2020).

AI-based performance management tools help in mitigating the gaps in the communication between the employee and the management by creating a real-time or near real-time face-to-face interaction and enabling the interaction through the chatbots subsequently. This results in retaining the talent by realigning the predicaments created among them for any reason not identified by the organisation earlier (Buck & Morrow, 2018). The intelligent systems like ‘Plause’ work on data analytics and try improving the relation between the managers and their teams by enabling the managers to understand their teams’ insights on different time frequencies before arriving to the appraisal time (Buck & Morrow, 2018). Also, other similar applications, viz. ‘Humu’, help the individuals to measure the key indicators and direct the employees and managers for self-evaluation towards a positive behavioural change, thus leading to the productivity and efficiency. The younger generation who represents the majority of work workforce in all the industries expects such an innovative method in the performance management where precision, transparency and integrity are the key elements (Buck & Morrow, 2018; Sahlin & Angelis, 2019). However, the AI-based applications in PMS are yet to occupy significant space in many organisations.

Implementation of AI in Training and Development

Salas et al. (2012) say that organisations spend billions of dollars on the training and development activities that enable organisations to adapt the change. This helps organisations to compete effectively, excel and innovate in the operations and develop sustainability across the organisational activities. Huselid and Becker (2011) affirm that well-organised training and development activities create the competitive workforce, optimisation of human resources and results in value and productivity across all the functions of business. For this reason, management contemplates on what to train, how to train, what are its implications and how to measure the training results. The increasing specialised skill requirements in the organisations started demanding the training and development activities to be more challenging and result yielding (Salas et al., 2012). Such complex requirements in the training and development have been addressed by the intelligent tools powered by the AI which are sustainable in nature (Maurya et al., 2023). These tools have initiated the personalised learning, intelligent training methods, automated content creation, adaptive testing, virtual assistance to the learner and trainer and predictive analytics and assessments. Fountaine et al. (2019) argue that organisations must start AI academies to promote AI internally and implement the AI tools to identify the taining needs at every organisational level. Maity (2019) says that AI has the ability to assess employees and map their performance to the required training needs. Also, AI could customise the learning methods that suit the learner and identifies the right trainer to the trainee. These AI training tools also help the HR and the employees to determine the training features such as duration, training pace, frequency and the assessments. Thus, organisations could mitigate the manual intervention in identifying the training needs and the selection of trainees, while enhancing the effectiveness of training by creating interactive platforms that make trainings more trainee centric (Maity, 2019). In addition to assisting in the training and development activities, AI is also used in the creation of the knowledge management environment to make the information accessible to the target groups in different context. By creating the AI-based collective knowledge management systems organisations could increase the information accessibility through the repositories that are loaded with the data in the forms of charts, case, scripts and other user-friendly visual formats.

Srimannarayana (2011) says that most organisations do not measure the impact of training on the individuals and the organisations in a routine, as they believe that measuring the results is expensive and several other pre-existent challenges make it difficult to measure. These challenges are addressed by the AI systems effectively by measuring and interpreting the results of the training into the actionable items at the individual trainee level (Maity, 2019). SAP Litmos is one such application that offers AI-driven learning management solutions to the organisations. Litmos serves a verity of clientele like LaborMAX, Epping Forest, Celigo and Ford Direct. Degreed is another California-based upskilling and technology company that uses AI for skill development of its employees. AI systems in the training and development define and develop the parameters by which training could be conducted by integrating the requirements of the trainee and the organisation.

Existent and Emerging AI Tools in HRM Functions

Several AI tools such as genetic algorithms, fuzzy sets and artificial neural networks (to name a few) are now being used in various functional areas of organisations (Arrieta et al., 2020; Holland, 1992). Ong (2019), which had stated that AI is growing rapidly in the areas, viz. Intelligent Talent Acquisition, employee engagement. Tools like Voice of Employees (VoE) and Virtual Assistant (VAs) have become a great help for HR personnel in this context. However, according to other few scholars (in the Asian perspective) AI's scope has also expanded to the digital recruitment, candidate's employment choice decisions, etc. (Linscott & Raghuraman, 2020; Mearian, 2023; Pillai & Sivathanu, 2020). Precisely, AI technology is revolutionising the HR function to emerge futuristic by digitalising the tasks at every layer of HRM (Huan et al., 2006). In the recent years, HR personnel are being supported by the intelligent systems in operations by an AI-based tool 'Mya'. This tool was developed by a San Francisco based HR tech company 'FirstJob'. As a VA in the knowledge management system, Mya handles interaction with the candidates and helps them understand the organisation in detail with ease (Zielinski, 2017). Empirical evidence from a study by Murugesan et al. (2023) reveals that implementation of AI tool in most of the IT and ITES organisations in India has resulted in the greater employee satisfaction.

IBM Watson is an advanced tool developed based on AI technology and adapted by HR managers in planning staffing and optimising the recruitment. IBM Watson also does analytics to make recommendations on the prioritisation of the required profiles. It predicts the right candidature and analyses the probability of resignations and exits with 95% of confidence. Also, IBM Watson assists the HR personnel in handling complex data management tasks and creates the enhanced employee experience in the organisation (Feuss, 2015; Jeude, 2020; Maity, 2019; Zielinski, 2017). Payroll management is empowered by the tools like 'AccountingSuite', which also had extended its functioning to the Cloud platform (PR Newswire, 2023). Amelia is another conversational AI-based virtual

HR assistant that helps recruitment processes, manages employee learning and provides the cordial learning experience to them. Amelia is developed by 'IPSoft', which has also diversified Amelia's abilities in different product versions for supporting the customer service and experience (*People Management*, 2023). Buck and Morrow (2018) mention in their study an intelligent system named Plause, which works on the data analytics to provide organisations better knowledge on the employee insights and perception towards the job and the company. Similarly, Humu is an AI-based tool that helps individuals to keep track of their performance and provides support for consistent self-evaluation (Buck & Morrow, 2018; Sahlin & Angelis, 2019). Another tool that is in the experimentation and testing phase is X.ai, which if successfully clears the testing phase could be deployed in the interview scheduling and calendar management of the HR executives. Industry offers the HR function a wide variety of conversational AI-based tools that handle tasks at different levels of HR functions. These tools include 'Skillate' a decision-making application, 'Marvin' a virtual recruiting consultant, 'Harver' a tool designed for mass hiring, 'Loxo' an application tracking system and several other tools in the development and testing phase.

Conclusion

AI is emerging rapidly beyond the conventional technology and has already been into the lives of individuals and organisations (Manning, 2020). However, its role as an intelligent application as it is meant to be is still in the nascent stage in several industries. The progress in the research and implementation of AI in the HRM in the next few years shall certainly see its prominence in the decision-making roles of HRs. Challenges in the development and the implementation of AI tools are persistent like in any other technology implemented by organisations. In spite of such challenges, AI is set on a course to intertwine into HR operations consistently.

Managerial Implications

The technological progression leads to the disruption of the conventional mode of functioning in the business. Considering the increasing pace of technological advancement organisations are required to make wise decisions in adapting the trends in technology with foresight (Jeude, 2020). Discussion from this study could help the practitioners, scholars in comprehending the latest developments in the AI with reference to the activities of HRM. Information related to the AI tools discussed in the literature helps the practicing HR managers in adapting the AI tools for HR planning workforce design, recruiting, training and development and performance appraisal. Most of the tools cited in this study are meant for the implementation of the process management in HR functions. Thus, the strategic leadership in the HR function could take insightful information related to the AI tools and evaluate their need for implementation for the organisational change towards the digitalisation (Quaquebeke & Gerpott, 2023). Industry practitioners, academicians and the research scholars could consider the inputs from the study to comprehend the availability of the AI tools and the applications that are in the nascent stage of development. This study had included detailed discussion on AI in HRM in spite of the dearth in scholarly data.

Limitations and Further Scope

While most of the content related to the existent status of the AI in the HRM function is discussed in this study there are few limitations that leave scope for the further research in this area. This study did not engage any empirical analysis as that methodology is not relevant to the identified objective. Researchers in future could conduct the empirical analysis to understand the behavioural impact of AI tools on the users. For instance, ease of performance evaluation, impact of AI hiring experience on the candidates, and impact of AI on employee productivity are few studies that could measure the impact of AI application on the behaviour of its stakeholders. This study had examined the status quo of the AI tools that are existent or in the development stage. However, future studies could evaluate the efficiency of these tools by studying their technical abilities. Comparative studies related to the AI tool belonging to similar domains can be done for further investigation. Also, the impact of AI tools on the HRM function could be studied by comparing it to the organisations that use conventional methods.

Acknowledgement

The authors are grateful to the anonymous referees of the journal for their extremely useful suggestions to improve the quality of the paper. Usual disclaimers apply.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding

The authors received no financial support for the research, authorship and/or publication of this article.

ORCID iD

Mohsin Khan https://orcid.org/0000-0001-7420-2455
Vijay Kumar Reddy https://orcid.org/0000-0001-7422-0151

References

Abdeldayem, M. M., & Aldulaimi, S. H. (2020). Trend and opportunities of artificial intelligence in human resources management: Aspirations for public sector in Bahrain. *International Journal of Scientific and Technology Research*, *9*(1), 3867–3871.

Almeida, F. (2022). Methods for identifying and evaluating disruptive technologies in university spinoffs. *The International Journal of Entrepreneurship and Innovation*, *23*(4), 240–252. https://doi.org/10.1177/14657503211050806

Anohya, R. (2017). *The history of artificial intelligence*. Harvard Business School https://sitn.hms.harvard.edu/flash/2017/history-artificial-intelligence/

Arrieta, A. B., Díaz-Rodríguez, N., Del Ser, J., Bennetot, A., Tabik, S., Barbado, A., Garcia, S., Gil-Lopez, S., Molina, D., Benjamins, R., Chatila., R., & Herrera, F. (2020). Explainable Artificial Intelligence (XAI): Concepts, taxonomies, opportunities and challenges toward responsible AI. *Information fusion, 58*, 82–115.

Awan, S. H., Habib, N., Shoaib Akhtar, C., &Naveed, S. (2020). Effectiveness of performance management system for employee performance through engagement. *SAGE Open*, *10*(4). https://doi.org/10.1177/2158244020969383

Bentley, K. A., Omer, T. C., & Sharp, N. Y. (2013). Business strategy, financial reporting irregularities, and audit effort. *Contemporary accounting research, 30*(2), 780–817.

Bodendorf, F., & Zimmermann, R. (2005). Proactive supply-chain event management with agent technology. *International Journal of Electronic Commerce*, *9*(4), 57–89. http://www.jstor.org/stable/27751165

Buck, B., & Morrow, J. (2018). AI, performance management and engagement: Keeping your best their best. *Strategic HR Review*, *17* (5), 261–262.

Čanković, V. Š. (2015). The impact of employee selection on organisatinal performance. *SEER: Journal for Labour and Social Affairs in Eastern Europe*, *18*(2), 217–230. http://www.jstor.org/stable/26379813

Chamorro-Premuzic, T., Winsborough, D., Sherman, R. A., & Hogan, R. (2016). New talent signals: Shiny new objects or a brave new world? *Industrial and Organizational Psychology*, *9*(3), 621–640.

Chen, H., Chiang, R. H. L., & Storey, V. C. (2012). Business intelligence and analytics: From big data to big impact. *MIS Quarterly*, *36*(4), 1165–1188. https://doi.org/10.2307/41703503

Cox, A. M., & Mazumdar, S. (2022). Defining artificial intelligence for librarians. *Journal of Librarianship and Information Science*. Advance online publication. https://doi.org/10.1177/09610006221142029

Dattner, B., Chamorro-Premuzic, T., Buchband, R., & Schettler, L. (2019, April 25). The legal and ethical implications of using AI in hiring. *Harvard Business Review*. https://hbr.org/2019/04/the-legal-and-ethical-implications-of-using-ai-in-hiring

Davison, H. K., Maraist, C., & Bing, M. N. (2011). Friend or foe? The promise and pitfalls of using social networking sites for HR decisions. *Journal of Business and Psychology*, *26*(2), 153–159. http://www.jstor.org/stable/41474863

Doll, J. L. (2022). Developing workforce planning skills in human resource management courses: A data-driven exercise. *Management Teaching Review*, *7*(1), 89–108. https://doi.org/10.1177/23792981211057227

Faix, A.-V. (2022). Qualitative innovation in the light of the normative: A minimal approach to promoting and measuring successful innovation in business. *IMIB Journal of Innovation and Management*, *2*(1). https://doi.org/10.1177/ijim.221091004

Fernández-Martínez, C., & Fernández, A. (2020). AI and recruiting software: Ethical and legal implications. *Paladyn, Journal of Behavioral Robotics*, *11*(1), 199–216. https://doi.org/10.1515/pjbr-2020-0030

Feuss, T. (2015). IBM Watson applied to intelligence problems. *National Defense*, *100*(742), 15. https://www.jstor.org/stable/27020983

Figueiredo, P. N., & Cohen, M. (2019). Explaining early entry into path-creation technological catch-up in the forestry and pulp industry: Evidence from Brazil. *Research Policy*, *48*(7), 1694–1713.

Fountaine, T., McCarthy, B., & Saleh, T. (2019). Building the AI-powered organization. (cover story). *Harvard Business Review*, *97*(4), 62–73.

Heller, C. H. (2019). Near-term applications of artificial intelligence: Implementation opportunities from modern business practices. *Naval War College Review*, *72*(4), 73–100. https://www.jstor.org/stable/26775520

Holland, J. H. (1992). Complex adaptive systems. *Daedalus, 121*(1), 17–30.

Huan, M.-J., Tsou, Y.-L., & Lee, S.-C. (2006). Integrating fuzzy data mining and fuzzy artificial neural networks for discovering implicit knowledge. *Knowledge-Based Systems*, *19*(6), 396–403. https://doi.org/10.1016/j.knosys.2006.04.003

Hunkenschroer, A. L., & Luetge, C. (2022). Ethics of AI-enabled recruiting and selection: A review and research agenda. *Journal of Business Ethics 178* (4), 977–1007. https://doi.org/10.1007/s10551-022-05049-6

Huselid, M. A., & Becker, B. E. (2011). Bridging micro and macro domains: Workforce differentiation and strategic human resource management. *Journal of Management*, *37*(2), 421–428

Jeske, D., & Shultz, K. S. (2016). Using social media content for screening in recruitment and selection: Pros and cons. *Work, Employment & Society*, *30*(3), 535–546. https://www.jstor.org/stable/26499476

Jeude, J. (2020). POINT: Artificial intelligence (AI) must be part of human capital management. *Workforce Solutions Review*, *11*(2), 25–27.

Kaplan, A., & Haenlein, M. (2019). Siri, Siri, in my hand: Who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence. *Business Horizons*, *62*(1), 15–25. https://doi.org/10.1016/j.bushor.2018.08.004

Karimi, J., Somers, T. M., & Bhattacherjee, A. (2009). The role of ERP implementation in enabling digital options: A theoretical and empirical analysis. *International Journal of Electronic Commerce*, *13*(3), 7–42. http://www.jstor.org/stable/27751295

Kaur, M., AG, R., & Vikas, S. (2021). Adoption of artificial intelligence in human resource management: A conceptual model. *Indian Journal of Industrial Relations*, *57*(2), 331–342.

Kim, K. Y., Pathak, S., & Werner, S. (2015). When do international human capital enhancing practices benefit the bottom line? An ability, motivation, and opportunity perspective. *Journal of International Business Studies*, *46*(7), 784–805. http://www.jstor.org/stable/43653775

Köchling, A., Riazy, S., Wehner, M. C., & Simbeck, K. (2021). Highly accurate, but still discriminatory. *Business and Information Systems Engineering*, *63*, 39–54. https://doi.org/10.1007/s12599-020-00673-w

Kong, H., Yuan, Y., Baruch, Y., Bu, N., Jiang, X., & Wang, K. (2021). Influences of artificial intelligence (AI) awareness on career competency and job burnout. *International Journal of Contemporary Hospitality Management*, *33*(2), 717–734. https://doi.org/10.1108/IJCHM-07-2020-0789

Kurniawaty, R., & Rosyadi, K. I. (2022). The role of human resource planning, demographic change and advances in information technology in management education (literature review thinking system). *Dinasti International Journal of Digital Business Management (DIJDBM)*, *4*(1), 36–45. https://doi.org/10.31933/dijdbm.v4i1

Linscott, M., & Raghuraman, A. (2020). *Aligning India's Data Governance Frameworks*. Atlantic Council. http://www.jstor.org/stable/resrep25999

Maity, S. (2019). Identifying opportunities for artificial intelligence in the evolution of training and development practices. *The Journal of Management Development*, *38*(8), 651–663. https://doi.org/10.1108/JMD-03-2019-0069

Manning, R. A. (2020). *Emerging technologies: New challenges to global stability*. Atlantic Council. http://www.jstor.org/stable/resrep26000

Maurya, A. M., Padval, B., Kumar, M., & Pant, A. (2023). To study and explore the adoption of green logistic practices and performance in manufacturing industries in India. *IMIB Journal of Innovation and Management*, *1*(2), 207–232. https://doi.org/10.1177/ijim.221148882

McCarthy, J. (1956). Measures of the value of information. *Proceedings of the National Academy of Sciences*, *42*(9), 654–655. https://doi.org/10.1073/pnas.42.9.654

Mearian, L. (2023, July 10). Q&A: How AI can help enterprise HR automate employee experiences. *Computerworld*. https://www.computerworld.com/article/1631024/qa-how-ai-can-help-enterprise-hr-automate-employee-experiences.html

Mehrotra, S., & Khanna, A. (2022). Recruitment through AI in selected Indian companies. *Metamorphosis*, *21*(1), 31–39. https://doi.org/10.1177/09726225211066220

Minbaeva, D. (2021). Disrupted HR? *Human Resource Management Review*, *31*(4), 100820. https://doi.org/10.1016/j.hrmr.2020.100820

Minsky, M. (1968). *Semantic information processing*. The MIT Press.

Murugesan, U., Subramanian, P., Srivastava, S., & Dwivedi, A. (2023). A study of artificial intelligence impacts on human resource digitalization in industry 4.0. *Decision Analytics Journal*, 7. https://doi.org/10.1016/j.dajour.2023.100249

Ong, K. (2019). Top 3 applications of AI in human resources. *Women of Color Magazine*, *19*(2), 72–75. https://www.jstor.org/stable/26924279

Oswald, F. L., Behrend, T. S., Putka, D. J., & Sinar, E. (2020). Big data in industrial-organizational psychology and human resource management: Forward progress for organizational research and practice. *Annual Review of Organizational Psychology and Organizational Behavior*, *7*, 505–533. https://doi.org/10.1146/annurev-orgpsych-032117-104553

Paesano, A. (2021). Artificial intelligence and creative activities inside organizational behavior. *International Journal of Organizational Analysis*, *31*(5), 1694–1723. https://doi.org/10.1108/IJOA-09-2020-2421

Palos-Sánchez, P. R., Baena-Luna, P., Badicu, A., & Infante-Moro, J. C. (2022). Artificial intelligence and human resources management: A bibliometric analysis. *Applied Artificial Intelligence*, *36*(1), Article 2145631. https://doi.org/10.1080/08839514.2022.2145631

Pearl, J. (1988). *Probabilistic reasoning in intelligent systems: Networks of plausible inference*. Morgan Kaufmann.

Pillai, R., & Sivathanu, B. (2020). Adoption of artificial intelligence (AI) for talent acquisition in IT/ITeS organizations. *Benchmarking: An International Journal*, *27*(9), 2599–2629. https://doi.org/10.1108/BIJ-04-2020-0186

Prakash, A. S., Gupta, A. K., & Kaur, S. (2022). Economic aspect of implementing green HR practices for environmental sustainability. *IMIB Journal of Innovation and Management*, *1*(1), 94–106. https://doi.org/10.1177/ijim.221109016

PR Newswire. (2023 June 21). AccountingSuite™ revolutionizes payroll management with new cloud payroll solution. *PR Newswire US*. https://www.prweb.com/releases/accountingsuite-tm-revolutionizes-payroll-management-with-new-cloud-payroll-solution-870756547.html

Quaquebeke, N. V., & Gerpott, F. H. (2023). The now, new, and next of digital leadership: How artificial intelligence (AI) will take over and change leadership as we know it. *Journal of Leadership & Organizational Studies*, *30*(3), 265–275. https://doi.org/10.1177/15480518231181731

Rąb-Kettler, K., & Lehnervp, B. (2019). Recruitment in the times of machine learning. *Management Systems in Production Engineering*, *27*(2) 105–109. https://doi.org/10.1515/mspe-2019-0018

Russell, S. (2021). The history and future of AI. *Oxford Review of Economic Policy*, *37*(3), 509–520. https://doi.org/10.1093/oxrep/grab013

Sahlin, J., & Angelis, J. (2019). Performance management systems: Reviewing the rise of dynamics and digitalization. *Cogent Business & Management*, *6*(1), Article 1642293.

Salas, E., Tannenbaum, S. I., Kraiger, K., & Smith-Jentsch, K. A. (2012). The science of training and development in organizations: What matters in practice. *Psychological Science in the Public Interest*, *13*(2), 74–101. http://www.jstor.org/stable/23484697

Schildt, H. (2017). Big data and organizational design the brave new world of algorithmic management and computer augmented transparency. *Innovation*, *19*(1), 23–30. https://doi.org/10.1080/14479338.2016.1252043

Simbeck, K. (2019). HR analytics and ethics. *IBM Journal of Research and Development*, *63*(4/5), 1–12

Srimannarayana, M. (2011). Measuring training and development. *The Indian Journal of Industrial Relations*, *47*(1), 117–125.

Tambe, P., Cappelli, P., & Yakubovich, V. (2019). Artificial intelligence in human resources management: Challenges and a path forward. *California Management Review*, *61*(4), 15–42. https://doi.org/10.1177/0008125619867910

Tuck, J. (2019). Mankind's greatest challenge: Artificial intelligence. *The Antioch Review*, *77*(3), 447–456. https://doi.org/10.7723/antiochreview.77.3.0447

Wang, Y. (2020). When artificial intelligence meets educational leaders' data-informed decision making: A cautionary tale. *Studies in Educational Evaluation*, *69*, 100872. Retrieved January 11, 2021, from https://doi.org/10.1016/j.stueduc.2020.100872

Wang, Y. (2021). Artificial intelligence in educational leadership: A symbiotic role of human-artificial intelligence decision-making. *Journal of Educational Administration*, *59*(3), 256–270. https://doi.org/10.1108/JEA-10-2020-0216

Welsh, R. (2019). Defining artificial intelligence. *SMPTE Motion Imaging Journal*, *128*(1), 26–32. https://doi.org/10.5594/JMI.2018.2880366

Yarger, L., Cobb Payton, F., &Neupane, B. (2020). Algorithmic equity in the hiring of underrepresented IT job candidates. *Online Information Review*, *44*(2), 383–395. https://doi.org/10.1108/OIR-10-2018-0334

Zhang, J., Feng, Q., Wang, S., Zhang, X., & Wang, S. (2016). Estimation of CO2–brine interfacial tension using an artificial neural network. *The Journal of Supercritical Fluids, 107*, 31–37.

Zielinski, D. (2017). Robot recruiters. *HR Magazine*, *62*(3), 64–65.

Original Article

What Lies in 'Business Incubation and SMEs' Research? A Literature Review and Roadmap for Future Research

IMIB Journal of Innovation and Management
3(1) 58–74, 2025

DOI: 10.1177/jinm.241245806
jim.imibh.edu.in

Vaishali Dhiman[1] and Manpreet Arora[1]

Abstract

The concept of 'Business Incubation and SMEs' has recently received a lot of interest in academic research and real-world business settings. Business incubator is a critical instrument for promoting entrepreneurial ecosystems and the growth of small and medium-sized enterprises (SMEs). Business incubation is a process that nurtures and promotes the growth of start-ups and early-stage companies. The aim of this article was to examine the existing literature on business incubators and SMEs in order to identify and highlight major as well as relevant themes and trends that can influence future research. The Scopus database was used to extract the data file. To develop network structures biblioshiny package of RStudio and VOSviewer was used. The results from the literature survey show some key observations highlight business incubators' changing nature, challenges, and impact on economic and entrepreneurship development. In addition, SMEs can be better served if incubation programmes are tailored to specific industries or technologies, for this, governments should encourage the establishment of specialised incubation centres.

Keywords

Business incubation, SMEs, innovation, start-ups, entrepreneurship

[1]HPKV Business School, School of Commerce and Management Studies, Central University of Himachal Pradesh, Dharamshala, Kangra, Himachal Pradesh, India

Corresponding author:
Vaishali Dhiman, HPKV Business School, School of Commerce and Management Studies, Central University of Himachal Pradesh, Dharamshala, Kangra, Himachal Pradesh 176215, India.
E-mail: Cuhp18rdmgmt13@hpcu.ac.in

Introduction

In recent years, business incubators have become the fundamental blocks to inject innovation and technology development into the country's economy. These are the indispensable components of economic development and tools for a nation's innovation policy (Caiazza, 2014). The business incubator has evolved over time into a mechanism for supporting a diverse industrial base and supports the local dimension of entrepreneurship through small and medium-sized enterprises (Lesakova, 2012). In general, business incubators help train small enterprises with their expertise, resources, and network connections, strengthening them to compete in the modern business ecosystem (Akpoviroro et al., 2021). In order to survive SMEs in today's global market, business incubation (BI) programmes were introduced that provide assistance, guidance and nurturing to SMEs for survival (Adegbite, 2001). It tries to reduce the chances of failure in small enterprises and provide support so that they can become independent ventures. The main goal of the business incubators is to promote innovation and technology transfer with the help of small and medium-sized ventures. SMEs are not only regarded as an innovation tool for country's industrial base development and vehicles to drive entrepreneurship (Mohammed Shameem, 2023), but also as a mechanism which contribute to reduce poverty and unemployment of the nation. Particularly in emerging economies nations, small and medium-sized businesses are regarded as engines of the economy because SMEs create a greater number of jobs and contribute to the gross domestic product (GDP) as well as the socio-economic development of a nation (Munkongsujarit, 2016).

Business incubators now serve as vital homes for entrepreneurs and start-ups because they help them prepare business proposals, facilitate networks and connections with other businesses, and provide direct or indirect funding, legal advice and other resources (Dhiman & Arora, 2024a). These are the effective tools, which look after SMEs and overall entrepreneurship, which subsequently foster technology innovation within the entrepreneurial ecosystem. SMEs play an essential role in boosting national economic growth and employment creation. In order to improve national economy, all nation's government, academician, practitioners and policy makers are highly interested in effective implementation of business incubation industry that fosters SMEs (Bismala et al., 2020), which would subsequently result in regional, national development and improves the wellbeing of all citizens. Business incubators play a crucial role in creating novel solutions to economic, technological (Wonglimpiyarat, 2016), and social issues of the 21st century worldwide. Therefore, their demand has increased drastically in recent years, and there are massive investments done by the government and industry for its growth and development, especially in emerging nations such as India, China, Brazil, Russia and many more.

According to the NASSCOM (2020) report (as shown in Figure 1), China is the world's leading country that has the highest number of active incubation and accelerators programme (3000+) in the world followed by the USA (1500+) and India has the third rank in the active programme for incubators and accelerators, that is, 520+. Out of these top three countries, two are emerging economies that is

Figure 1. Holders of Highest Incubation Centers From Emerging Economies.

Source: NASSCOM Database, Zinnov CoNXT Research & Analysis.

China and India. With special reference to India, the total number of programmes includes 200+ incubators and accelerators supported by the Ministry of Micro, Small and Medium Enterprises (MSME) for the development and growth of SMEs. Earlier, business incubators were formed to provide basic services and assistance to new venture to generate business ideas and work on its implementation. But nowadays landscape of business incubation is changing rapidly due to high demand of technological, sustainable and innovative start-ups and SME sector is responsible for creating such ventures.

Objective of the Study

The objective of the study was to review the literature on 'Business Incubation and SMEs' research to understand future research directions and identify the emerging trends and major themes of the said research area.

Therefore, this article has conducted a literature survey using Scopus database papers to provide understanding regarding 'Business Incubation and SMEs' to identify major themes, trends, and directions for future research. The next section provides the details of the data collection strategy, followed by results and discussion, which were based on extracted data from Scopus. The last section summarises the conclusion of the study.

Data Collection Strategy

In order to analyse and find the literature on BI and SMEs a Scopus search was performed. The search process uses the term 'business incubation' AND 'SME' OR 'small and medium enterprises' OR 'small and micro enterprises' as of 17 May 2023 within the Scopus database. In the refinement process, before filtration, the results developed in the database a total of 30 documents only. During refinement of the result, five papers were found inappropriate and excluded. A final set of 25 papers have been reviewed in order to understand the literature and its contributions in terms of ‘business incubation’ AND ‘SME’ OR ‘small and medium enterprises’. Further, network analysis software, that is, Bibliomtetix package of RStudio software and VOSviewer, has been applied to identify the thematic links and emerging trends for future research.

The search string used is as follows: TITLE-ABS-KEY (‘*business incubation’ AND* ‘*SME’ OR* ‘*small and medium enterprises’* OR ‘*small and micro enterprises’*)

Results and Discussion

The papers mentioned in Table 1 were studies from 1992 to 2022, showing a progression in research focus from understanding the dynamics of BI in the context of SMEs, evaluating their effectiveness, addressing challenges, exploring regional variations, and examining the intersections with various industries and policies. 1992–1998 reflects a foundational understanding of a growing interest in incubation models and their effectiveness in supporting SME development. Paper from 2004 to 2005 shows the focus on support mechanisms provided by incubators to enhance the competitiveness of SMEs. The year 2009 describes the integration with the national innovation system. From 2012 to 2014, the authors talked about the importance of financial support and entrepreneurial activities for SMEs in their early stages. From 2015 to 2017, the authors’ paper discussed about sustainability and challenges. The next years (2018–2020) addressed the regional and industry-specific focus. Recent papers (2021–2022) focused on diversification and adaptation of incubation frameworks to diverse economic landscapes.

Literature Survey of Table 1 Papers

The success of a business incubator depends upon the degree of fit between the offering of incubator services and the needs of the tenants and the local market (Autio & Klofsten, 1998). There is a great value of having a good ‘fit’ between the needs of tenants and the services of a business incubator that an incubator can offer. But the BI’s role has changed from a traditional incubator of a service and facility providers into a consultant organisation that provides resources, knowledge, and policy coordination for both companies and national innovation systems. It now offers services to help tenant firms on their way to becoming successful business ventures that can efficiently and independently manage their business activities and bring social change and technological development (Tsai et al., 2009). Despite the benefits of BI programmes and the rising interest in them, the path towards entrepreneurship is full of obstacles and challenges. Lose and Tengeh (2015) focused on challenges faced by business incubators in assisting their incubatee start-ups. The findings showed that the challenges faced by incubators were lack of sponsorship, growth into other locations, cutting-edge technology, manufacturing space, development into new markets, and goal of

Table 1. Literature Extracted From Scopus Database on Topic 'Business Incubation and SMEs'

Rank	Document Title	Authors	Cited By	Source	Year
1	'Small and Medium Enterprises: Technology Policies and Options'	A. S. Bhalla	3	*Small and Medium Enterprises: Technology Policies and Options*	1992
2	'A Comparative Study of Two European Business Incubators'	E. Autio, M. Klofsten	142	*Journal of Small Business Management*	1998
3	'Support to Small and Medium Enterprises: Business Incubators in Slovakia'	O. Kašjaková	0	*Journal of Business Economics and Management*	2004
4	'Promoting Business Incubation for Improved Competitiveness of Small and Medium Industries in Korea'	H. Kim, Y-J. Lee, M. D. Ames	7	*International Journal of Technology Management*	2005
5	'The Co-evolution of Business Incubation and National Innovation Systems in Taiwan'	F-S. Tsai, L. H.Y. Hsieh, S-C. Fang, J. L. Lin	73	*Technological Forecasting and Social Change*	2009
6	'Business Incubation and Its Connection to Venture Capital'	D. Klonowski, D. J. Cumming	2	*Venture Capital: Investment Strategies, Structures, and Policies*	2012
7	'Business Incubator as a Tool of Support of Small and Medium Size Enterprises'	P.T. Prochazkova	10	*E a M: Ekonomie a Management*	2012
8	'Entrepreneurship and Incubation Activities in Praxis: Benchmarking Observations'	P.T. Prochazkova	3	*Vision 2020: Sustainable Growth, Economic Development, and Global Competitiveness: Proceedings of the 23rd International Business Information Management Association Conference, IBIMA 2014*	2014
9	'The Sustainability and Challenges of Business Incubators in the Western Cape Province, South Africa'	T. Lose, R. K. Tengeh	33	*Sustainability (Switzerland)*	2015
10	'Synthesising TBI-Relevance In India Through Six Sigma Approach'	S. S. Singh, B. J. Singh, D. Khanduja	3	*International Journal of Entrepreneurship and Innovation Management*	2015
11	'An Evaluation of the Effectiveness of Business Incubation Programs: A User Satisfaction Approach'	T. Lose, R. K. Tengeh	5	*Investment Management and Financial Innovations*	2016
12	'Business Incubators and Challenges: Evidences From Pakistan'	N. Mahmood, F. Jamil, H. Munir, N. Yasir, C. Jianfeng	1	*Advanced Science Letters*	2017

(Table 1 contined)

(Table 1 contined)

Rank	Document Title	Authors	Cited By	Source	Year
13	'Business Incubation Model for Startup Company and SME In Developing Economy: A Case of Thailand'	S. Munkongsujarit	8	*PICMET 2016: Portland International Conference on Management of Engineering and Technology: Technology Management for Social Innovation, Proceedings*	2017
14	'An Empirical Analysis of the Effect of Business Incubation Process on Firm Performance in Nigeria'	A. S. Iyortsuun	18	*Journal of Small Business and Entrepreneurship*	2017
15	'Mapping Knowledge Management for Technology Incubation'	J. S. Suroso, A. S. Girsang, F. L. Gaol	2	*Advances in Intelligent Systems and Computing*	2018
16	'Issues and Challenges of Technology Business Incubators in The Philippines'	F. D. Esponilla, J. P. Alinsunod, H.T. Ignacio … K. C. Dela Cruz, I. C. Valenzuela	1	*International Journal of Emerging Trends in Engineering Research*	2019
17	'Internationalisation of Small and Medium Enterprises in Indian Business Incubators'	L. Gomathi, N. Gopinathan	3	*International Journal of Recent Technology and Engineering*	2019
18	'Enhancing Small and Medium Enterprises Performance Through Innovation in Indonesia: A Framework for Creative Industries Supporting Tourism'	R. Prima Lita, R. Fitriana Faisal, M. Meuthia	18	*Journal of Hospitality and Tourism Technology*	2020
20	'Applying the Ecosystem Model in a New Context? The Case of Business Incubation in Oman'	N. Al-Baimani, N. Clifton, E. Jones, R. Pugh	8	*Growth and Change*	2021
21	'Dark Side of the Family Business: An Exploratory Perspective'	O. J. Montiel Mendez, A. Soto Maciel	3	*Journal of Family Business Management*	2021
22	'Business Incubation: Understanding the Process'	P. Manniledam, T. Radha Ramanan	0	*Entrepreneurship and Skill Development in Horticultural Processing*	2021
23	'Business Incubators in Russia: 2020 Survey in International Comparative Perspective'	M. A. Slesarev	0	*Vestnik MGIMO-Universiteta*	2022
24	'Urbanisation and SME Growth in a Developing Economy: Implications for Policy'	M. Bomani, E. Derera, M. Mashingaidze	3	*Corporate Governance and Organizational Behavior Review*	2022
25	'Performance of Spice-based Enterprises Facilitated Through AgriBusiness Incubators (ABI)'	T. Ashwini, S. Lokesh, B. P. Bonny	0	*Journal of Tropical Agriculture*	2022

self-sufficiency, which were identified as major issues. Another research on SMEs was conducted by Prima Lita et al. (2020) in which they investigated how organisational culture and entrepreneurial attitude influence the success of SMEs in Indonesia's cutting-edge tourist sector. According to the study's findings, corporate culture and an entrepreneurial mindset have a significant impact on innovation, which in turn influences how well SMEs succeed. Authors argued that to enhance the future success of SMEs, businesses and the government should collaborate with business incubators, and counselling institutes to increase technology transfer and innovation.

As per Iyortsuun (2017), SMEs are recognised as economic development tools, and governments all over the world construct organisations to help them expand and flourish. Business incubators serve as critical building blocks for entrepreneurship promotion and SME development. To solve the issues faced by SMEs, Prochazkova (2012) analyses the concept of business incubators, which provide early-stage firms with a wide range of resources and services from their inception. The study focused on the use of business incubators to boost SMEs, which are an important part of the global economy but confront numerous challenges. The purpose of the research is to assess the efficiency of business incubators as a tool for aiding SMEs. Al-Baimani et al. (2021) investigated the extension of Oman's entrepreneurial ecosystem, focusing on BI activities as a policy instrument for developing local, regional, and national institutions for supporting entrepreneurship and SME expansion. The authors mentioned that in the modern business world, an increasing number of new start-up businesses are emerging and entering to the market, that are making the business landscapes more complex. In developing nations, the start-up firms, which begin as SMEs, are viewed as the engine for economic growth and development. However, new start-up ventures struggle to flourish in the extremely competitive industry without a strong business plan and support. One of the systems that emerged to support these new businesses is the business incubator that is why its relevance is highly increased in today's world (Munkongsujarit, 2016). Kim et al. (2005) surveyed the business incubator's operation and found that they were providing office space, management skills, legal, technical, and funding assistance to their tenants. The findings suggested that the Korean economy is growing fast by creating new ventures, and the government made a significant contribution to fostering entrepreneurship and promoting new ventures and SMEs with the help of business incubators.

Lose and Tengeh (2016) illustrated that getting funding assistance was the major obstacle faced by entrepreneurs. The findings of the study reported a large section of entrepreneurs have achieved their objectives by participating in an incubation programme. Also, young founders participate more in the incubation programmes, and there is a high chance of failure in the first three years of business initiation. So, incubators assist ventures mostly for the initial years and help in increasing the chance of survival. Bomani et al. (2022) investigated the challenges faced by SMEs and government assistance provided to urban SMEs in Zimbabwe. The findings showed that urban SMEs confront a number of challenges, including difficulty in accessing finance, whereas lack of technical and managerial skills and strict governmental rules pose further challenges. Although the government introduced some policies in favour to assist SMEs, these policies and programmes were insufficient. The government should allocate more funds to the sector's support, including encouraging SMEs for clusterisation of and building more business incubators to speed up the transfer of technology and skills. To achieve sustainable growth, the government ought to find a balance between regulatory requirements and the expansion of the SME sector. Montiel Mendez and Soto Maciel (2021) investigated and established a link between potential elements known as the 'dark side' of family businesses (DSFB), which can be both productive and destructive. This unique and novel perspective on the 'dark side' contributes to the fields of entrepreneurship and family business (FB) research. Using the 'dark side' approach, the research methodology included a thorough evaluation and analysis of pertinent literature on entrepreneurship and FB. The study's findings indicate that there are various areas within this topic that merit additional investigation. One critical issue is the need for a more exact definition of the DSFB construct itself, as well as a deeper understanding of the motivations or forces that drive this dark side. These impacts may come from the entrepreneur/founder, the FB entity, or the larger milieu in which they operate. A systemic approach is essential, considering the context's major and decisive influence.

Gomathi and Gopinathan (2019) investigated internationalisation of SMEs in Indian business incubators. The authors explored how BI might aid in the globalisation of SMEs. By supporting their growth and development in international trade, business incubators primarily aim to increase the survival rate of start-up businesses, ultimately nurturing their success in promoting the expansion of entrepreneurship. International business operations are indispensable to protect companies from resource shortages in light of the growing globalisation of the business environment. The economy of developing nations like India have been rattled by the potential and challenges of economic liberalisation and the global market. The significant political and economic developments present difficult problems for the public sector, private industry, and international emerging nations. However, many new businesses fail in both industrialised and developing nations, and of the few that do survive and expand, there are various issues and challenges they face. In order to make traditional methods more effective in terms of cost for small businesses and related international assistance programmes in the current competitive market presents a problem and is a difficult objective to achieve. Technical business incubation (TBI) is one of the most cutting-edge tools supporting the development of small businesses globally (Singh et al., 2015).

Prochazkova (2014) stated that BI models assist in nurturing the young start-ups and contribute to the entrepreneurial activities. In recent times, start-up founders or entrepreneurs are viewed as a key source of future economic development and growth, and these aspirants need business development support and services to flourish. The sector of small and middle-sized businesses (SMEs) has emerged as the most active agents in the country's economy and has proven to be essential to both national and international competitiveness. As a result, the

SMEs' entrepreneurial activity became the centre of attraction of incubation. Bhalla (1992) offered a thorough review of the possibilities available to SMEs in developed and developing nations, as well as urban and rural settings. The policies and programmes that affect small and medium-sized firms, the innovation potential of these companies, and the institutions and infrastructure that are most supportive towards their development in emerging and developed economies are the major themes explored by the author. The approach of knowledge management assists the organisations to reuse the knowledge for the success and growth of the organisation. Technology and Business incubator is one of the different business growth methods that might assist to start and expand businesses by entrepreneurs. In the article of Suroso et al. (2018), knowledge management for business and technology incubators has been mapped out using Tegal regency in Central Java, Indonesia, as a case study. The findings indicated that knowledge management for business and technology incubators can assist entrepreneurs in outpacing their competitors in their respective fields and gain competitive advantage in market. The business incubators have established their existence as a mechanism for fostering the growth of innovative SME-based companies. Business incubators provide abundance of knowledge resources to founders of start-up companies. They offer a wide range of services designed to lower a company's failure rate and raise its chances of long-term viability. Klonowski and Cumming (2010) found that the relationship between venture capitalists and business incubators has shifted in recent years. When the Internet bubble burst, venture investors appeared to lose interest in start-ups and did not like to participate in BI activities. As a result, there came a gap in the market where entrepreneurial ventures from the SME sector find it increasingly difficult to find financial partners. In this situation, business incubators have played a significant role, to support the SME sector in the absence of appropriate access to capital.

TBIs are currently the popular trend for enabling SMEs or start-up firms. Esponilla et al. (2019) have investigated the challenges and issue faced by TBI in nurturing and fostering the SMEs. The study found that insufficient finances, lack of policy framework, problems with operational activities, lack of cooperation and awareness among team members, slow procurement of equipment’s in the laboratory, and lack of skills professional were common issues in all the business incubators. Despite the increased interest in BI programmes because of numerous support and facilities they offer to their clients, business incubators face a number obstacles and challenges, which were the focus of (Mahmood et al., 2017) article. Some of the major challenges of business incubators have been identified as the lack of modern and appropriate ICT facilities, the lack of sponsorship programmes for entrepreneurs, the lack of production space for facilitating BI programmes, and the failure of business incubators to expand to new locations due to financial constraints. According to Slesarev (2022), entrepreneurial and small innovative firms face considerable financial and managerial challenges in the early phases of their development. Therefore, it is important to give them enough support from the beginning that is why incubators were developed as a major component of local entrepreneurial ecosystems and as a potential driver of SME support infrastructure in Russia throughout the 2010s. The results indicated that a number of positive changes have been done for beneficial improvements to business incubators in Russia, including a rise in annual funding, increased square fit area, average yearly resident count, staff size, etc. The overall number of business incubators also dramatically decreased at the same time, indicating that all of the aforementioned positive improvements were not reflect the expended market size of BI or the most efficient structures being scaled up; rather, they were the result of effective optimisation. There is another type of incubators, that is, agri-business incubators (ABI) have been established by many agricultural institutes to foster agricultural venture creation. The performance of spice businesses marketed through ABI was examined in the article. The findings indicated that most ventures were in their infancy and need financial and technical support to grow. Regardless of the size of the business, the data imply that the entrepreneurs who successfully completed the BI programme witnessed greater success. Authors have suggested policy recommended that ABIs should be promoted as technology enablers for agricultural entrepreneurship growth (Ashwini et al., 2022).

Manniledam and Radha (2021) stated that SMEs are the backbone of an entrepreneurial ecosystem and play a pivotal role in a country's economic growth. SMEs are established to support the start-up industry of a nation. Globalisation and industrialisation has stated a new era of systematic innovation and entrepreneurship that ensures the sustainability of SMEs. The concept of business incubators emerged in the late 1950s, to support small-scale start-up units that overcome their challenges for scarce resources. These start-ups are nurtured by business incubators so that they can develop technology-based products. It was found that in the majority of start-up business models, physical infrastructure is required for office space and the process of developing and producing products. In conclusion, it is admitted that BI is a mechanism that has been used to support SMEs for the last two decades. Both developed and developing nations are more progressive to foster SMEs as they are the tools to promote social and economic growth. Business incubators provide a variety of support programmes such as technical aid, financing assistance, an easy regulatory system, training programmes, and innovation support that helps them to grow and survive (Kašjaková, 2004).

Major Themes, Patterns & Findings from Literature Survey

A comprehensive review of the literature on business incubators and their role in supporting SMEs also shows several major themes, patterns and findings. Here are some key highlights from the literature survey:

1. Business incubators transformation: Business incubators have evolved substantially over time to accommodate transforming economic settings, technical innovations, and the changing needs of entrepreneurs and start-ups. They have evolved from basic workspace providers to full-service start-up support platforms. By providing a full set of shared resources, knowledge transfer, networking, training and mentoring to assist their tenants to become an independent succeeding business.

2. Significance of fit: The success and effectiveness of a business incubator is well related to its capacity to customise its support and resources to fit the unique needs of the tenants they host as well as the dynamics of the local market.
3. Face challenges: It is well acknowledged that business incubators provide every possible support to make a start-up independent but with this support provider, they face various issues, such as lack of modern technology facilities, difficulty growing to new regions and financial constraints. These difficulties may limit their ability to foster businesses.
4. Facilitates economic development: For economic development, business incubator plays a significant role by fostering SMEs and start-ups because they ultimately contributes to economic development, particularly in emerging or failing economies. SMEs are responsible for innovation, GDP, creating employment, and reduce poverty.
5. Policy and government assistance: Government action and assistance are frequently required for the success of BI programmes. Only government incentives and money may in many situations persuade private organisations to participate in incubation efforts.
6. Internationalisation: From the existing literature business incubators are increasingly being viewed as enablers of SMEs' internationalisation. They provide assistance and coaching to start-ups as they expand into global markets, thereby contributing to economic growth and employment creation.
7. Knowledge transfer: Knowledge transfer and management is critical to the efficacy and profitability of business incubators as these organisations expand and provide full support to entrepreneurs. Effective knowledge exchange and dissemination can provide a competitive advantage and drive innovation in start-ups.

Emerging Trends for Future Research

Word cloud is used to visualise the available literature on BI in relation to SMEs. It determines which topics or themes receive the majority of attention. The words, which are bigger in size, present that the literature is highly concentrated on those keywords, while the words in smaller size indicate future directions or opportunities of research. With the use of word cloud, the text data are transformed into tags, which are often single words whose relative value can be seen in the size.

It is evident from Figure 2 that BIs, SMEs, Entrepreneurial Skills, Small Business, and Incubation are the most frequently occurring keywords. These keywords are of high relevance and received great attention in the literature. The Business incubator denotes a major emphasis on the assistance and nurturing of nascent enterprises through incubation programmes. The emphasis on SMEs reflects a focus on the function of small and medium-sized firms in the economy. These businesses frequently generate innovation, create jobs, and make substantial contributions to economic development. The emphasis on entrepreneurial skills demonstrates the importance of providing individuals with the information and talents required for starting and managing successful businesses.

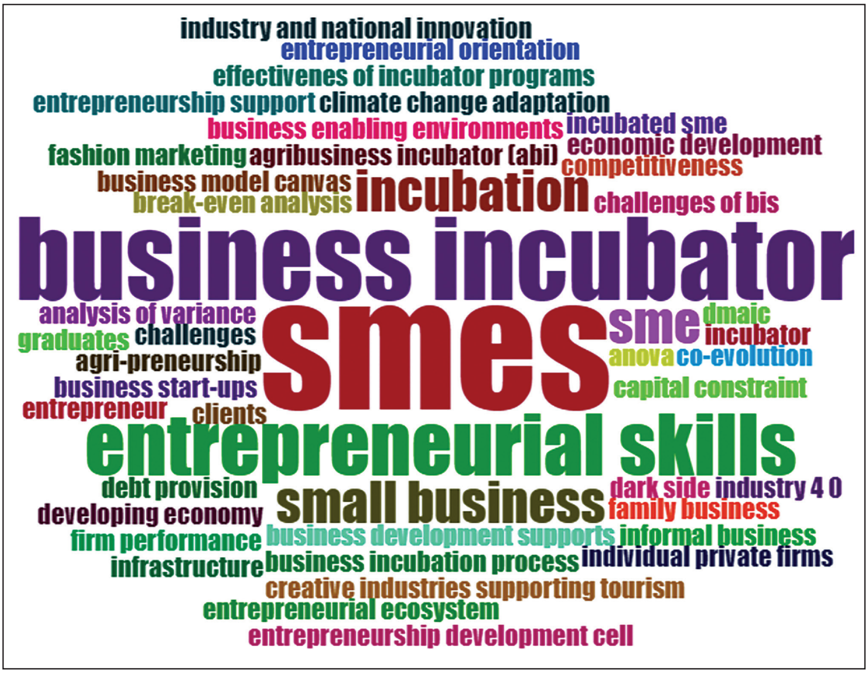

Figure 2. Word Cloud.

Source: Extracted from RStudio.

The least frequently occurring keywords are entrepreneurship development cell, sustainability, creative industries, and national innovation. The less frequent occurrence of 'entrepreneurship development cell' could indicate a more specific focus should be given on organisational units or projects inside educational or institutional contexts geared to creating entrepreneurial spirit and skills. Another least occurring keyword 'sustainability' shows that discussions may not be as focused on the long-term environmental, social, and economic sustainability elements within business firms. The keyword 'national innovation' low frequency suggests that discussions may not centre on national initiatives to foster innovation and technological progress. By combining most prominent words with least prominent words, a new scope for future research can be generated.

Co-occurrences Analysis

The co-occurrences of keywords are used to represent the conceptual relationships among the research constituents. This analysis helps to identify core and major themes of the research area (Dhiman & Arora, 2024b). Co-occurrence analysis also trace the current knowledge structure of the field of study chosen for research (Rani & Salanke, 2023).

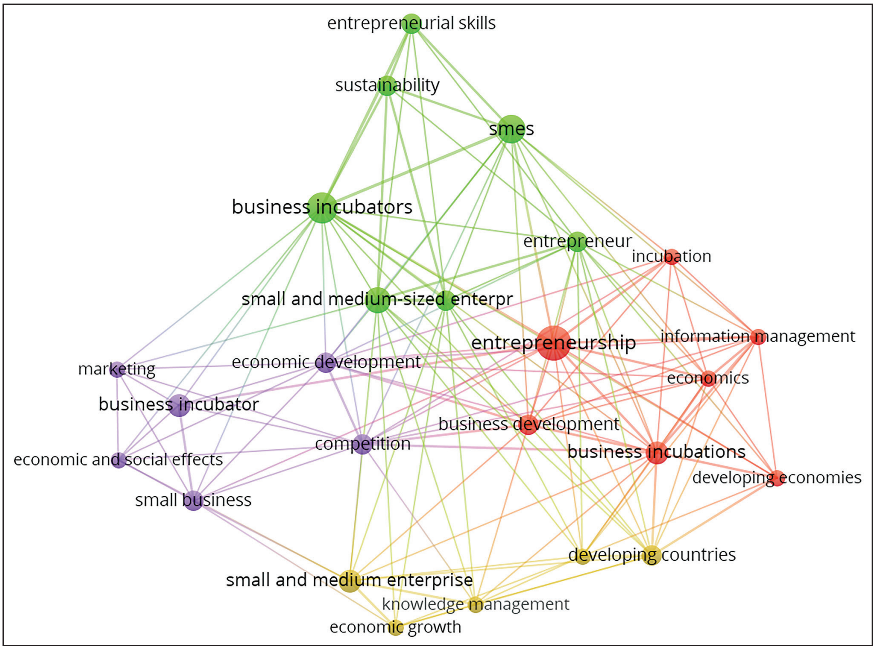

Figure 3. Co-occurrence of All Keywords.

Source: Extracted from VOSviewer.

By running the co-occurrences analysis in the VOSviewer software, four clusters are formed, as shown in Figure 3. The first big cluster is red in colour having 7 items and the biggest node was 'entrepreneurship' with occurrence of 9, followed by 'business incubations', 'business development', 'economics', 'developing economics', and 'information management'. This cluster emphasises the importance of these keywords in establishing and sustaining entrepreneurial endeavours. The terms 'business incubations' and 'business development' highlight the importance of enabling infrastructure and strategic growth activities for businesses. This clustering implies a comprehensive view of entrepreneurship, including support systems, strategic development, economic ramifications, and successful organisational information practices.

Second big cluster is green in colour having six items with the biggest node 'business incubators', 'SMEs', 'Small and medium-sized enterprise', 'sustainability' and 'entrepreneurial skill'. These keywords represent a thematic connection at the intersection of business development, environmental morality, and skill acquisition and the cluster shows these are the components of entrepreneurial ecosystem that intertwines support networks, economic contributors, environmental considerations, and individual skill development. Third cluster is purple in colour with six items, 'economic development', 'business incubator', 'small business', 'competition', and 'economic and social effect'. This cluster demonstrates an integrated approach to promoting regional growth

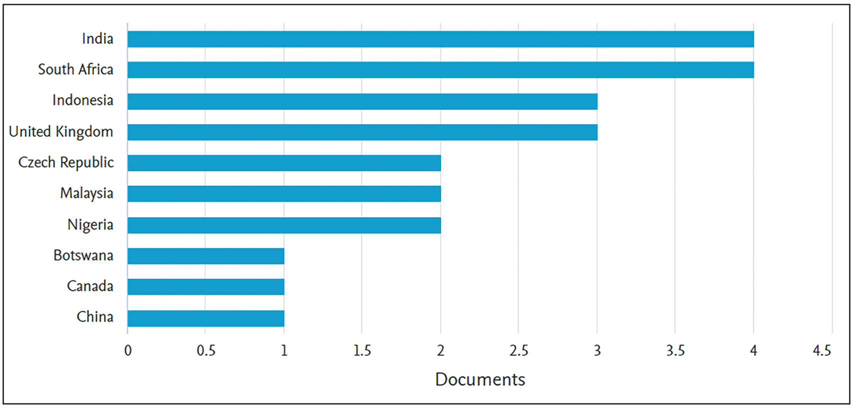

Figure 4. Most Productive Countries.

Source: Extracted from Scopus.

and sustainability and community-oriented growth with the help of incubators and small businesses. Small business support becomes critical, as they are essential drivers of job creation, economic variety, and innovation, contributing greatly to the general wellbeing of a community or area. Finally, a small yellow cluster has four items with the biggest circle of 'small and medium enterprise', 'knowledge management', 'developing countries', and 'economic growth'.

Major Contributing Countries to the Topic

In Figure 4, India is found to be a highly productive country in terms of paper production according to the Scopus database. Emerging countries such as India, South Africa and Indonesia are more progressive toward the concept of BI and SMEs. Because SMEs and business incubators are the major contributing factors for economic development, knowledge transfer, internationalisation and innovation. These countries are more focused to enhance their economic development and sustainability with business incubators and SMEs and hence conducting more research on the said topic.

Conclusion, Future Research Opportunities, and Limitations

This literature survey underscores the critical role that business incubators play in nurturing entrepreneurship, promoting economic development, and supporting SMEs. Also, reveals several significant trends in the transformation of business incubators, particularly emphasising the importance of aligning incubator offerings with the needs of tenants, innovation, knowledge exchange, technology transfer and internationalisation of small businesses. Their evolution into comprehensive support systems reflects the changing landscape of entrepreneurship. However, they face challenges, including financial constraints and the need for government support.

Despite these challenges, business incubators continue to be instrumental in fostering innovation, job creation, and economic growth in both developed and developing nations.

Future research on BI in the context of SMEs holds huge potential to further understand how BI programmes can effectively support and foster the growth of SME. To accomplish this future research can focus on developing specialised or tailored BI programmes for different SMEs. The keywords, entrepreneurship development cell, national innovation, creative industries, sustainability, information and knowledge management, have the lowest occurring frequency which may indicate an unexplored territory in the current literature, opening up new avenues for future research and investigation. Furthermore, a comprehensive examination of the challenges and opportunities confronting SMEs in developing countries, with a focus on their relationships with incubators, might give significant insights for policymakers and practitioners. Along with this, a cross-country comparative study can provide nuanced perspectives on how cultural, economic, and legal variables influence the effectiveness of BI projects and SME development. To sustain SME's growth, post-incubation services must be provided to incubated SME's. Developing a fertile innovation ecosystem that complements the role of incubation centres is essential for policymakers. This involves fostering collaboration between academic institutions, research institutes, and the private sector in order to create an environment conducive to innovation and entrepreneurship.

The significant limitation of this study underling in fact that this literature survey solely relies on a single database, that is, Scopus. Therefore, this study may suffer from lack of comprehensiveness because Scopus may not include all the relevant journals or sources. There is a chance that relevant literature published and indexed in other sources and databases (WoS, ProQuest, EBSCO, etc.) might missed in this study. So future studies can combine two or more sources to improve the comprehensiveness of this type of literature survey. The research field is dynamic, and new studies can either contradict or enhance current knowledge. A review of the literature may not capture ongoing claims or novel developments in real time.

Acknowledgements

The authors are grateful to the anonymous referees of the journal for their extremely useful suggestions to improve the quality of the article.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding

The authors received no financial support for the research, authorship and/or publication of this article.

ORCID iD

Vaishali Dhiman https://orcid.org/0000-0002-1149-6334

References

Adegbite, O. (2001). Business incubators and small enterprise development: The Nigerian experience. *Small Business Economics*, *17*(3), 157–166.

Akpoviroro, K. S., Oba-Adenuga, O. A., & Akanmu, P. M. (2021). The role of business incubation in promoting entrepreneurship and SMEs development. *Management and Entrepreneurship: Trends of Development*, *2*(16), 82–100.

Al-Baimani, N., Clifton, N., Jones, E., & Pugh, R. (2021). Applying the ecosystem model in a new context? The case of business incubation in Oman. *Growth and Change*, *52*(2), 663–686.

Ashwini, T., Lokesh, S., & Bonny, B. P. (2022). Performance of spice-based enterprises facilitated through Agri-Business Incubators (ABI). *Journal of Tropical Agriculture*, *59*(2). https://jtropag.kau.in/index.php/ojs2/article/view/1022

Autio, E., & Klofsten, M. (1998). A comparative study of two European business incubators. *Journal of Small Business Management*, *36*(1), 30.

Bhalla, A. (1992). *Small and medium enterprises: Technology policies and options*. Intermediate Technology Publications.

Bismala, L., Andriany, D., & Siregar, G. (2020). Development strategy analysis of technology business incubator in small medium enterprises accompaniment. *Journal of Critical Review*, *7*(1), 221–225.

Bomani, M., Derera, E., & Mashingaidze, M. (2022). Urbanisation and SME growth in a developing economy: Implications for policy. *Corporate Governance and Organizational Behavior Review*, *6*(2), 123–133.

Caiazza, R. (2014). Benchmarking of business incubators. *Benchmarking: An International Journal*, *21*(6), 1062–1069.

Dhiman, V., & Arora, M. (2024a). Exploring the linkage between business incubation and entrepreneurship: Understanding trends, themes and future research agenda. *LBS Journal of Management and Research*. https://www.emerald.com/insight/content/doi/10.1108/LBSJMR-06-2023-0021/full/pdf?title=exploring-the-linkage-betweenbusiness-incubation-and-entrepreneurship-understanding-trends-themes-and-futureresearch-agenda

Dhiman, V., & Arora, M. (2024b). How foresight has evolved since 1999? Understanding its themes, scope and focus. *Foresight*, 26(2), 253–271.

Esponilla, F., Alinsunod, J., Ignacio, H., de Guzman, H., de Guzman, E., Dela Cruz, K., & Valenzuela, I. (2019). Issues and challenges of technology business incubators in the Philippines. *International Journal of Emerging Trends in Engineering Research*, *7*(9), 2347–3983.

Gomathi, L., & Gopinathan, N. (2019). Internationalization of small and medium enterprises in Indian business incubators. *International Journal of Recent Technology and Engineering*, *8*, 971–980.

Iyortsuun, A. S. (2017). An empirical analysis of the effect of business incubation process on firm performance in Nigeria. *Journal of Small Business and Entrepreneurship*, *29*(6), 433–459.

Kašjaková, O. G. (2004). Support to small and medium enterprises-business incubators in Slovakia. *Journal of Business Economics and Management*, *5*(3), 155–163.

Kim, H., Lee, Y. J., & Ames, M. D. (2005). Promoting business incubation for improved competitiveness of small and medium industries in Korea. *International Journal of Technology Management*, *32*(3/4), 350–370.

Klonowski, D., & Cumming, D. J. (2010). Business incubation and its connection to venture capital. In D. Cumming (Ed.), *Venture capital: Investment strategies, structures, and policies* (pp. 111–129).

Lesakova, L. (2012). The role of business incubators in supporting the SME start-up. *Acta Polytechnica Hungarica*, *9*(3), 85–95.

Lose, T., & Tengeh, R. K. (2015). The sustainability and challenges of business incubators in the Western Cape Province, South Africa. *Sustainability*, *7*(10), 14344–14357.

Lose, T., & Tengeh, R. K. (2016). An evaluation of the effectiveness of business incubation programs: A user satisfaction approach. *Investment Management and Financial Innovations*, *13*(2), 370–378.

Mahmood, N., Jamil, F., Munir, H., Yasir, N., & Jianfeng, C. (2017). Business incubators and challenges: Evidences from Pakistan. *Advanced Science Letters*, *23*(9), 8479–8483.

Manniledam, P., & Radha, R. T. (2021). Business incubation–understanding the process. In K. P. Sudheer & V. Indira (Eds), *Entrepreneurship and skill development in horticultural processing* (pp. 29–41). CRC Press.

Shameem Mohammed, P. (2023). Implications of Schumpeter's and Kirzner's economic models of entrepreneurship for Indian women. *IMIB Journal of Innovation and Management*, *1*, 9.

Mendez Montiel, O. J., & Soto Maciel, A. (2021). Dark side of the family business: An exploratory perspective. *Journal of Family Business Management*, *11*(4), 386–401.

Munkongsujarit, S. (2016, September). *Business incubation model for start-up company SME in developing economy: A case of Thailand* [Paper presentation]. 2016 Portland International Conference on Management of Engineering and Technology (PICMET) (pp. 74–81). IEEE Publications.

Prima Lita, R., Fitriana Faisal, R., &Meuthia, M. (2020). Enhancing small and medium enterprises performance through innovation in Indonesia: A framework for creative industries supporting tourism. *Journal of Hospitality and Tourism Technology*, *11*(1), 155–176.

Prochazkova, P. T. (2012). Business incubator as a tool of support of small and medium size enterprises/Podnikatelsky inkubator jako nastroj podpory maleho a stredniho podnikani. *E + M Ekonomie a Management*, *15*(3), 91–108.

Prochazkova, P. T. (2014). Vision 2020: Sustainable growth, economic development, and global competitiveness. In *Proceedings of the 23rd International Business Information Management Association Conference (IBIMA 2014)* (Vol. *1*, pp. 2140–2148).

Rani, A., & Salanke, P. (2023). A bibliometric analysis on business and management research during COVID-19 pandemic: Trends and prospects. *IMIB Journal of Innovation and Management*, *1*(2), 233–246.

Singh, S. S., Singh, B. J., & Khanduja, D. (2015). Synthesizing TBI-relevance in India through Six Sigma approach. *International Journal of Entrepreneurship and Innovation Management*, *19*(3–4), 256–283.

Slesarev, M. A. (2022). Business incubators in Russia: 2020 survey in international comparative perspective. *MGIMO Review of International Relations*, *15*(4), 102–129.

Suroso, J. S., Girsang, A. S., & Gaol, F. L. (2018). Mapping knowledge management for technology incubation. In T. Theeramunkong, A. M. Skulimowski, T. Yuizono & S. Kunifuji (Eds), *Recent advances and future prospects in knowledge, information and creativity support systems: Selected revised papers from the tenth international conference on knowledge, information and creativity support systems (KICSS 2015), 12–14 November 2015, Phuket, Thailand 10* (pp. 179–187). Springer International Publishing.

Tsai, F. S., Hsieh, L. H. Y., Fang, S. C., & Lin, J. L. (2009). The co-evolution of business incubation and national innovation systems in Taiwan. *Technological Forecasting and Social Change*, *76*(5), 629–643.

Wonglimpiyarat, J. (2016). The innovation incubator, university business incubator and technology transfer strategy: The case of Thailand. *Technology in Society*, *46*, 18–27.

Original Article

Assessment of Practical Knowledge Through Open Book Examination in the Undergraduate Course at the University: Students' Perspective

IMIB Journal of Innovation and Management
3(1) 75–88, 2025

DOI: 10.1177/ijim.241255447
jim.imibh.edu.in

Shefali Naik[1] and Jap Purohit[1]

Abstract

In the professional degree, understanding the concepts is important, along with their applications in the real world. Students should have hands-on experience during their study at the university to solve real-world problems effectively in their professional careers. The practical examination to test students' lab skills is one of the assessment methods. In the engineering programme, instructors conduct the practical examination in different courses in either open-book or closed-book mode at Ahmedabad university. To find out the students' perspective on the effectiveness of an open-book practical examination, the study was carried out to answer the following hypotheses: Should there be a practical exam? Is it easy to score in the open-book practical exam? Does practical knowledge help to solve real-life problems? And is an open-book practical exam as effective as a closed-book exam? For the study, a questionnaire was circulated through Google Forms to the undergraduate students. Both quantitative and qualitative responses were recorded through questionnaires and interviews. Students enrolled in the different courses of engineering responded to the questionnaire and answered the questions in person. The analysis of the student survey was done using the chi-square method. From the *p* value, it was concluded that the null hypotheses were rejected, which proved that open-book practical exams are better. As per the students' perspective, open-book practical exams are as difficult as closed-book exams. It is not easy to score in the open-book practical exam without understanding the concepts, even though the syntaxes and resources are available.

[1]School of Engineering and Applied Science, Ahmedabad University, Ahmedabad, Gujarat, India

Corresponding author:
Shefali Naik, School of Engineering and Applied Science, Ahmedabad University, Ahmedabad, Gujarat 380009, India.
E-mail: shefali.naik@ahduni.edu.in

Keywords
Education, higher education, assessment, examination, open-book examination

Introduction

In real life, theoretical knowledge and practical knowledge complement each other. While theoretical knowledge provides a fundamental understanding of concepts, practical knowledge enables individuals to implement and utilise those concepts in real-world situations. This relationship between theoretical and practical knowledge is equally important in academics, as students need both theoretical knowledge and practical experience to apply the concepts they learn during their school or college study. By gaining practical experience, students can develop a deep understanding of the subject matter and develop critical thinking skills that could be applied to real-world problems (Naik & Gajjar, 2023).

However, it is not enough to assign projects, assignments and lab exercises. It is also crucial to evaluate whether students have truly understood the practical applications of the theoretical concepts. This is where practical examinations play an important role. To test whether students have truly understood the practical problem and are able to solve it correctly, a practical exam could be conducted that throws a challenging problem in front of them which needs to be solved within the stipulated time. These exams help students develop critical thinking skills, handle pressure and provide solutions within a given time frame, which ultimately boosts their confidence. Additionally, faculty can evaluate whether practical understanding is achieved or not and improvise on their teaching methods.

Due to COVID-19 and the rise of online classes and examinations, the concept of open-book examinations has gained popularity. However, there has always been a debate about its efficiency (Williams & Wong, 2009) and whether it should be promoted.

The open-book examination has its own pros and cons, but it helps students to focus on gaining a better understanding of theoretical concepts rather than just memorising them. The open-book examination also eliminates the stress of memorising. On the other hand, there is a concern that students may become casual towards learning and may not put in enough effort to truly understand the concepts, resulting in ineffective learning.

Overall, the effectiveness of open-book examinations depends on the difficulty level of the problem statement, the students' approach to addressing the problem and their dedication towards learning/doing.

Literature Survey

Quite a bit of research has been conducted on the practical examination and its mode of conduct, especially after the global COVID-19 pandemic brought it into the limelight. There are studies which focus on various aspects of open-book examinations. The details are provided below.

One study (Brightwell et al., 2004) aimed to test the assumption that open-book examinations provide a better learning environment for students. A student in an anatomy and physiology course took an online multiple-choice exam in class and then took the same exam again with their textbooks. The results showed no significant difference in scores, suggesting that well-designed questions can assess student abilities in both open- and closed-book environments.

However, in another study (Feldhusen, 1961), the author discusses and analyses the value of the student ratings for the open-book examination and its relation to the examination scores. Also, he concludes that the open-book examination measures different abilities than the closed-book examination.

A study conducted by Block (2012) describes the use of open-book tests, closed-book tests and notecards in tests for an introductory statistics course. A review of the literature shows that open-book assessments are universally recognised to reduce anxiety. However, the literature is mixed on whether deeper learning or better preparation occurs with open-book exams. The study reviews the testing policy of the Math300 Statistics course, which evolved from closed-book exams to open-book exams to closed-book exams with notecards. Based on the author's experience, it led to increased student enjoyment of the course while continuing to encourage deeper student learning.

Another research study (Ashri & Sahoo, 2021) describes the impact of the COVID-19 pandemic, the way it disrupted the higher education sector and the way it forced Indian academic institutes to adopt new methods for evaluating students. While many universities in India chose not to hold exams due to public health concerns, the University of Delhi conducted an online open-book examination (OBE). The article evaluates the strengths, weaknesses, opportunities and challenges of online OBEs by drawing details from a wide range of literature. Additionally, the authors of this study compared student performance in OBEs and closed-book exams. They found that students generally score higher in OBEs compared to closed-book exams.

As per the findings of the study by Theophilides and Koutselini (2000), the students preparing for a closed-book examination tend to procrastinate their study at the end of the semester, concentrate on the assigned texts and memorise information. However, students preparing for an open-book examination tend to consult various sources and associate the information acquired. When taking the exam, they work productively, while at the same time probing deeply into the knowledge gained.

Furthermore, open-book practical examination and its importance is not only restricted to computer science subjects such as database management systems (Naik, 2014), computer networks and computer vision but is also applicable to the fields of nursing (Johanns et al., 2017), medicine (Zaguryorly & Durning, 2021), aviation and many more.

As a whole, the literary analysis broadened the perspective of this study and also helped in approaching this research. Additionally, it had a significant influence on the choices that were made as part of this primary study.

Data Analysis

Quantitative Survey

About the Data

The quantitative survey was conducted for university undergraduate students with majors in computer science and engineering who were asked to fill out a questionnaire based on their experience with practical examinations. A total of 80 responses were collected using Google Forms. Out of these, 78 students appeared in the practical examinations. These 78 responses represent the population size for performing quantitative data analysis.

For quantitative data analysis, four hypotheses were formulated and tested using statistical methods. These hypotheses are as follows and are discussed in detail in the section ‘Hypotheses Testing’.

1. There should be no practical examination.
2. It is easy to score in the open-book examination.
3. Practical knowledge helps to solve real-life problems.
4. The open-book practical examination is as good as the closed-book examination to test one’s understanding of the concepts.

Data Distribution and Visualisation

Out of 78 students, 56.4% (44) confirmed that they had an open-book practical examination and 43.6% (34) confirmed that they had a closed-book practical examination. Thereby, to avoid the biases generated because of the absence of closed-book examination takers in the population set, a sample dataset was created using random sampling. The sample size consisted of 66 students, with 33 students who took an open-book practical exam and 33 students who took a closed-book practical exam.

Based on the quantitative survey, 86% (57) of the students strongly believe that the practical evaluation component (assignments, labs and practical assessments) provides more hands-on experience of the theoretical concepts. However, only 3% (2) of the students decline this belief, and the remaining students are not sure about whether the practical evaluation component provides them with more hands-on experience with the theoretical concept.

The quantitative survey also indicated, as shown in Figure 1, that 92% (61) of the students agreed that practical knowledge of theoretical concepts helps them to solve real-life problems or is helpful in their professional life. However, about 6% (4) of students are neutral about the statement, and 2% (1) totally disagree with it.

Figure 2 shows that the majority of the participants believe that a practical examination is a good way of testing the practical understanding they have gained in the course.

The participants were asked to express their thoughts about the open-book examination, and Figure 3 shows that 68% (45) believe that even if the notes are available, a person could not answer the question correctly if he or she does not

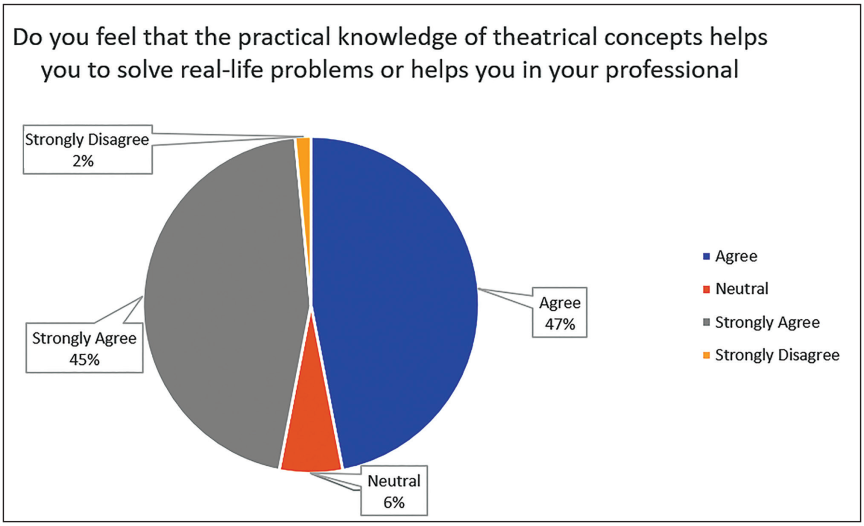

Figure 1. Findings About the Usefulness of Practical Knowledge in Solving Real-life Problems.

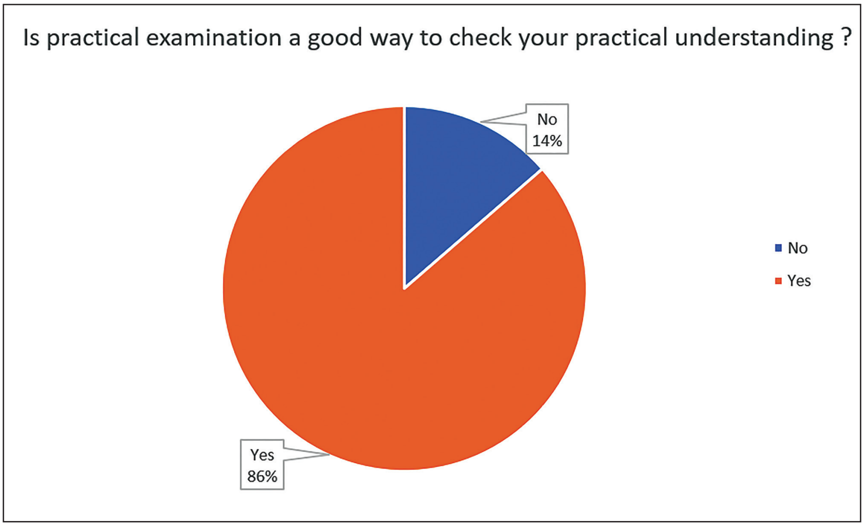

Figure 2. Should There Be a Practical Examination?

know the concepts. Furthermore, 54% (36) believe that an open-book exam can help to solve syntax errors.

Figure 4 shows the student preferences for the mode of examination. As per the figure, 68% of them preferred an open-book, and 32% preferred a closed-book practical examination.

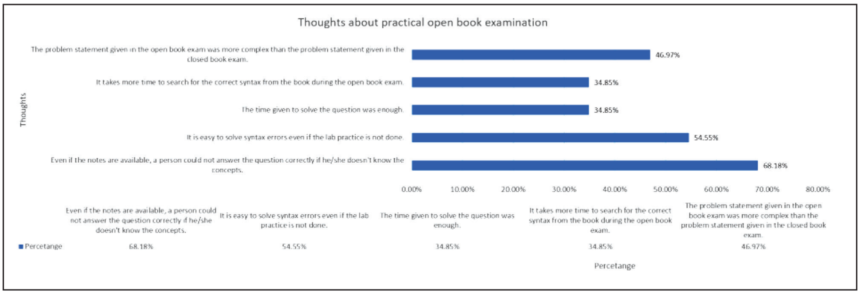

Figure 3. Thoughts About an Open-book Practical Examination.

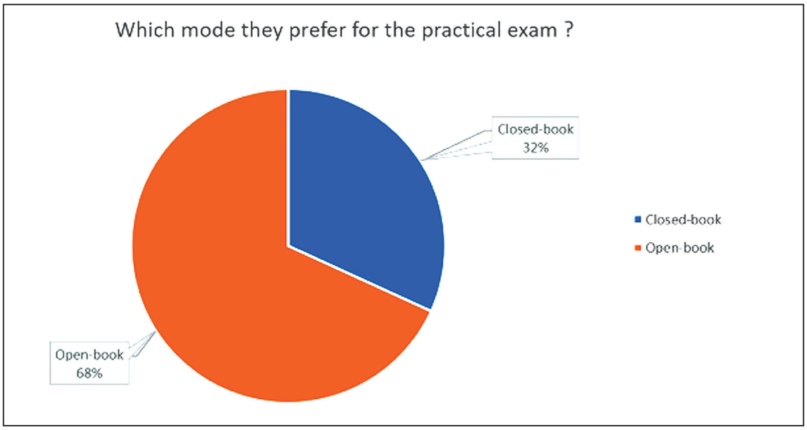

Figure 4. Preferred Mode of Examination.

Qualitative Survey

As part of the qualitative survey, a total of six interviews were conducted to gather qualitative data. Each participant's transcript was initially coded independently, providing context for the raw data in relation to the research questions. Groups were created based on individual coding and many similarities, as well as some unique qualities, were found in the transcripts written after the interviews. Based on responses from participants in the qualitative survey, additional information from the participants was collected. The common trait among the participants was a lack of awareness about the importance of practical knowledge. The survey was not limited to students who took only open-book practical exams. Another trait was their casual approach and shyness to share details, but during the verbal survey, they were confident and honest in discussing their experiences of the open-book practical exam.

The majority of students are willing to take an open-book practical examination. They believe that this can be a good way to check their practical understanding, which they have acquired from theoretical knowledge. However, they are also concerned about the possibility of unfair means being used during online open-book examinations, such as sending answers to friends via various platforms. Additionally, they mentioned that open-book examinations can relieve the pressure of memorising concepts and they can concentrate on understanding concepts. A handful of people also mentioned that due to open-book examinations, students are solely responsible for their grades, and there will be no blame on the system for their low scores.

Results/ Findings of the Analysis

Quantitative Survey

Result Visualisation

Over the years, it was believed that scoring in open-book practical examinations would be easier than in closed-book examinations. However, after conducting data analysis and visualisation, it was found that even with an open-book examination, achieving a high score is not a simple task. In fact, over 50% of respondents indicated that they did not find this to be true.

Thereby, to find the credibility of the responses, further analysis was done by comparing the marks achieved in a closed-book versus an open-book practical examination. Figure 5 depicts that the average score of closed-book examinations was higher than that of open-book examinations. Hence, providing evidence gives the insight that it is not easy to score in an open-book examination.

The graph in Figure 6 shows that having a lower score implicitly implies satisfaction with an examination score, which will be lower when it is an open-book examination. However, it was the opposite and it was found that the majority of them were satisfied with scores and did not have more than a 7% difference in the satisfaction level of open-book and closed-book scores, as shown in Figure 7.

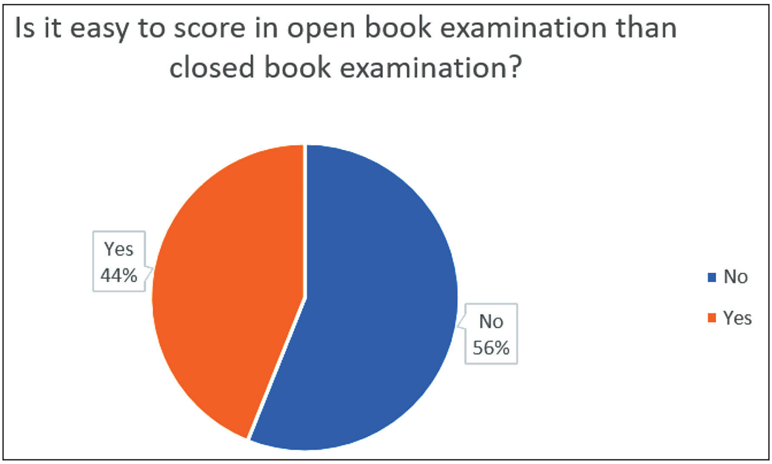

Figure 5. Is it Easy to Score in a Closed-book Examination?

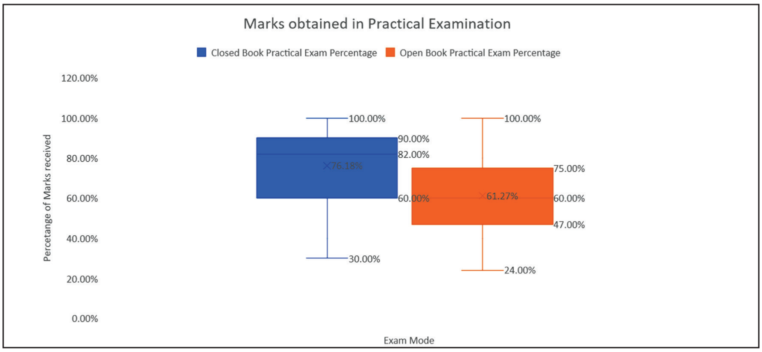

Figure 6. Close-book vs. Open-book Practical Examination Score.

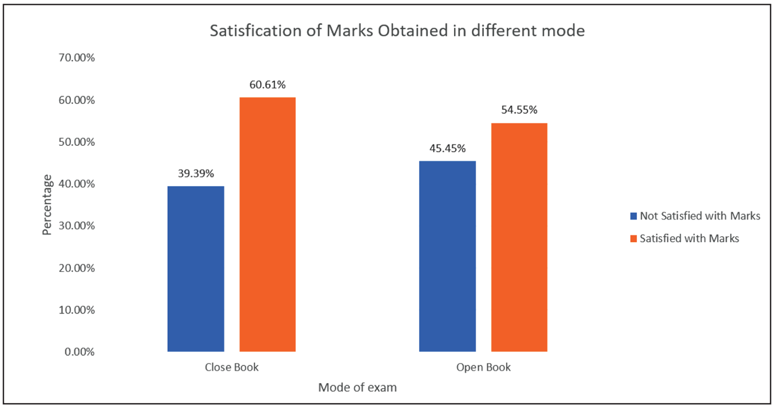

Figure 7. Satisfaction of Close-book vs. Open-book Practical Examination Score.

Therefore, to understand the reason for being satisfied despite a low average score, it can be inferred from Figure 8 that, even though there is an open-book examination, it is not easy to score in that if your concepts are not clear and you are not dedicated or serious about learning them. So, to assert this thought, the overall percentage was quantified as students' dedication level and mapped with a practical score to understand whether if a student is dedicated, then they can score better irrespective of the mode of examination.

Hypothesis Testing

Based on the quantitative survey, respondents were asked whether practical examinations were a good way to check their practical understanding. Using the data points, the above hypothesis was formulated. Based on the chi-square test results shown in Table 1 with a *p* value less than the significance level of .05 (Naik & Purohit, 2023), the null hypothesis was rejected. Therefore, the research

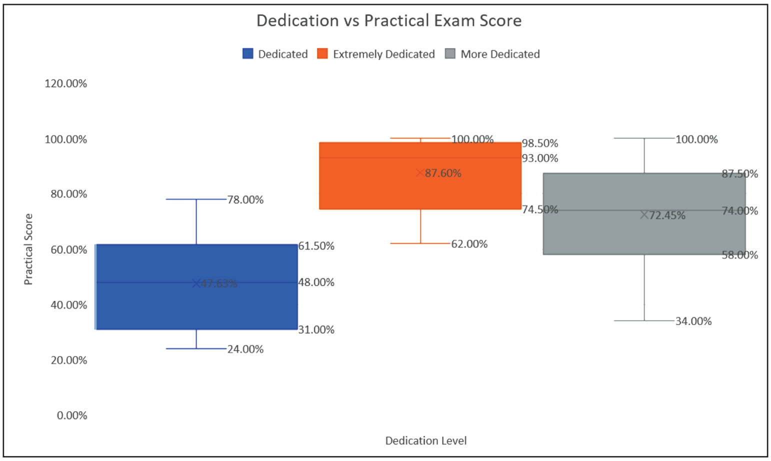

Figure 8. Dedication vs. Practical Exam Score.

Table 1. Hypothesis Testing: Should There Be a Practical Examination?

n	66			
Category	Hypothesis	Observed	Expected	Test
H_0	0.7	9	46.2	29.95325
H_1	0.3	57	19.8	69.89091
		66		99.84416
p value	1.64873148431 27E-23			

Note:
H_0: There should be no practical examination.
H_1: There should be a practical examination.

question ‘Should there be a practical examination?’ was answered in the affirmative, as there should be a practical examination.

According to the results of the quantitative survey, it was analysed whether test-takers find it easier to get good scores in open-book examinations compared to closed-book examinations. Using the gathered data, the hypothesis mentioned above was formulated. Based on the chi-square test results shown in Table 2, with a p value less than the significance level of .05, the null hypothesis was rejected. Therefore, the answer to the research question ‘Is it easy to score in an open-book examination?’ is that it is not easy to score in an open-book examination.

The research investigated whether test-takers believed that applied knowledge is necessary to solve real-life problems. This led to the hypothesis that practical knowledge is required. The results of the chi-square test shown in Table 3 reject this hypothesis, with a p value less than the significance level of .05, thus answering the research question ‘Is practical knowledge required to solve real-life problems?’ with confidence.

Table 2. Hypothesis Testing: Is it Easy to Score in an Open-book Examination?

n	66			
Category	Hypothesis	Observed	Expected	Test
H_0	0.3	37	19.8	14.94141414
H_1	0.7	29	46.2	6.403463203
		66		21.34487734
p Value	3.83644507668856000000E-06			

Note:
H_0: It is easy to score in an open-book examination.
H_1 = It is not easy to score in an open-book examination.

Table 3. Hypothesis Testing: Is Practical Knowledge Required to Solve Real-life Problems?

n	66			
Category	Hypothesis	Observed	Expected	Test
H_0	0.3	30	19.8	5.254545
Agree	0.2	31	13.2	24.00303
Neutral	0.2	4	13.2	6.412121
Disagree	0.2	0	13.2	13.2
H_1	0.1	1	6.6	4.751515
		66		53.62121
p Value	6.31701902255519E-11			

Notes:
H_0: It is not easy to score in an open-book examination.
H_1: It is easy to score in an open-book examination.

Based on the results of a quantitative survey, further investigation was conducted to determine whether test-takers prefer open-book practical examinations. Using this data, the aforementioned hypothesis was developed. After conducting the chi-square test, the null hypothesis needs to be accepted since the *p* value is greater than the significance level of .05. Therefore, the inference shown in Table 4 can be drawn: open-book practical examinations may be preferred, answering the research question ‘Should open-book practical examinations be given preference?’

Qualitative Survey

After conducting one-on-one interviews and reviewing the notes taken during the interviews, the following three themes were developed. These themes serve as the core concepts of the research and allow for analysis and the provision of various perspectives from the interviewees. These perspectives are essential to the research.

Table 4. Hypothesis Testing: Should an Open-book Practical Examination Be Given Preference?

n	66			
Category	Hypothesis	Observed	Expected	Test
H_0	0.5	37	33	0.484848485
H_1	0.5	29	33	0.484848485
		66		0.96969697
p Value	3.2475576540261800000000E-01			

Notes:
H_0 = The open-book practical examination is as good as the closed-book examination to test one's understanding of the concepts.
H_1 = The open-book practical examination is not as good as the close-book examination to test one's understanding of the concepts.

Practical Examination Is a Good Way to Check the Applied/Hands-on Knowledge

Based on the interviews conducted, the common inference drawn was that practical exams are valuable for validating understanding, while project-based learning and labs are effective in developing practical skills that are crucial for real-life problem solving. Participants emphasised the significance of practical understanding and critical thinking skills taught by practical exams. Additionally, exams improve the ability to work under pressure and solve problems within time constraints. All participants agreed that practical exams are necessary to accurately assess skills. The interviews highlighted the importance of project-based learning and labs in preparing individuals for real-world problem solving. Therefore, based on the interviews conducted, it is evident that practical exams, project-based learning and labs are essential for developing practical skills. These skills are crucial for individuals to excel in real-world problem-solving scenarios.

Pros and Cons of an Open-book Examination

After conducting interviews with various students, it can be concluded that online examinations have both advantages and disadvantages. Although online exams have become increasingly popular in recent years, they have become even more so after the global pandemic that forced many educational institutions to shift to remote learning and assessments. Interviews revealed that open-book exams are less stressful, especially practical exams, as students do not have to memorise syntax and other theoretical concepts, which may not be as important. This feature of open-book exams can be particularly helpful for students who struggle with memorisation or have test anxiety. Additionally, students are solely responsible for their marks. If they are unable to achieve the desired results, they have no one to blame but themselves. This can be motivating for some students, as it can encourage them to take ownership of their learning and to work harder to achieve their goals. Lastly, it could avoid mental health problems due to test anxiety or stress. However, there is a downside to open-book/online exams. The exams that allow students to access the internet increase the possibility of unfair means during the examination. This can create biases against other students who may not have access to the same resources or who may not be as technologically savvy. In addition, there are concerns about cheating and academic integrity. However, this issue can be addressed by increasing the number of invigilators to monitor students during the examination. This can help to ensure that students are following the rules and that the exam is fair for all participants. Lastly, sometimes students might get relaxed due to open-book examinations and do not put effort into learning concepts if they are aware from the start of the curriculum that the exams will be open-book. Hence, it was advised not to declare from the very beginning. In summary, open-book exams can be beneficial for some students, but there are also potential drawbacks that must be considered and addressed. It is important for educators to weigh the pros and cons of open-book exams and to consider the needs of their students when deciding whether to implement this type of assessment. Overall, open-book exams have the potential to be a valuable tool for assessing student learning, but it is important to ensure that they are conducted in a fair and ethical manner.

The Mode of Practical Examination Does Not Play Any Role in the Marks Achieved

After conducting and analysing the qualitative interviews, it became clear that a practical examination should be conducted in addition to the theoretical exams. The qualitative interviews highlighted that practical exams are essential to assess how efficiently and effectively students can implement their theoretical understanding to solve real-life problems within a time constraint. On the other hand, the mood of the examination does not seem to matter as much as the nature of the exam. Students believe that even if a book is given, it would be time-consuming and difficult to solve the problem within the given time constraint if they had not studied throughout the semester or year. Therefore, the mood of the examination does not matter as much as the nature of the test. To solve problems in the examination, students need to go through notes or a textbook and be aware of each concept's location. While an open-book exam may seem like a good idea, in reality, it may not be practical if the student has not been dedicated throughout the semester or year of study.

Hence, practical exams are essential in addition to theoretical exams, and the mode of the examination does not matter as much as the nature of the test. The student's ability to implement their theoretical understanding and solve real-life problems within a time constraint is the most crucial factor for a successful exam.

Conclusion

After conducting both qualitative and quantitative research in this area of study, significant insights were gathered, and several research questions were answered. One key finding was that students are well prepared and eager to take practical examinations, as they consider it an important evaluation criterion. The mode of examination does not seem to be a significant factor in determining student performance.

Instead, their dedication and curiosity play a major role in achieving good marks, according to both students and policymakers. Therefore, it is recommended that educational institutes conduct practical examinations, with the mode of examination left to their discretion. However, it is worth noting that the research found that students generally prefer an open-book examination. This format provides them with the opportunity to access relevant materials during the exam, which they believe can help them perform better. It is the instructor's responsibility to ask the questions in such a way that students can get help for syntax errors, not for logic or problem solutions, from the allowed sources/references/books. In conclusion, our research suggests that educational institutes should focus on encouraging and fostering student dedication and curiosity to ensure good academic performance.

Acknowledgment

The authors are grateful to the anonymous referees of the journal for their extremely useful suggestions to improve the quality of the article.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

ORCID iDs

Shefali Naik https://orcid.org/0000-0002-0785-4282
Jap Purohit https://orcid.org/0009-0005-9350-7672

References

Ashri, D., & Sahoo, B. P. (2021). Open book examination and higher education during COVID-19: Case of university of Delhi. *Journal of Educational Technology Systems*, *50*(1), 73–86.

Block, R. M. (2012). A discussion of the effect of open-book and closed-book exams on student achievement in an introductory statistics course. *PRIMUS*, *22*(3), 228–238.

Brightwell, D. R., Daniel, J. H., & Stewart, D. A. (2004). Evaluation: Is an open book examination easier? *Bioscience Education*, *3*(1), 1–10.

Feldhusen, J. F. (1961). An evaluation of college students' reactions to open book examinations. *Educational and Psychological Measurement*, *21*(3), 637–646.

Johanns, B., Dinkens, A., & Moore, J. A. (2017). Systematic review comparing open-book and closed-book examinations: Evaluating effects on development of critical thinking skills. *Nurse Education in Practice*, *27*, 89–94.

Naik, S. (2014). *Concepts of database management systems (BCA)*. Pearson Education.

Naik, S., & Gajjar, K. (2023). Applying and evaluating engagement and application-based learning and education (enable): A student-centered learning pedagogy for the course database management system. *Journal of Education*, *203*(2), 410–422.

Naik, S. T., & Purohit, J. A. (2023). Effectiveness of e-crossword puzzle tool in the multidisciplinary course for the undergraduate students [Paper presentation]. *The 16th Annual ACM India Compute Conference* (pp. 37–42).

Theophilides, C., & Koutselini, M. (2000). Study behavior in the closed-book and the open-book examination: A comparative analysis. *Educational Research and Evaluation*, *6*(4), 379–393.

Williams, J. B., & Wong, A. (2009). The efficacy of final examinations: A comparative study of closed-book, invigilated exams and open-book, open-web exams. *British Journal of Educational Technology*, *40*(2), 227–236.

Zaguryorly, I., & Durning, S. J. (2021). Assessing open-book examination in medical education: The time is now. *Medical Teacher*, *4*(3), 972–973.

Original Article

Content Analysis of Dividend Distribution Policy of Indian Listed Companies

IMIB Journal of Innovation and Management
3(1) 89–103, 2025

DOI: 10.1177/jinm.241252529
jim.imibh.edu.in

Meraj Inamdar[1], Ranjith Krishnan[1] and Shweta Mehrotra[2]

Abstract

This study attempts to perform content analysis, which is based on specific paradigms of unobtrusive research techniques, including conceptual and document analysis of the dividend distribution policies of the top 200 listed companies by market capitalisation to assess whether the policies enunciated by the companies align with the parameters suggested in the SEBI regulation. To conduct a content analysis, the authors use a three-step methodology to collect the dividend distribution policy documents and thus evaluate their content. First, we revisited the regulatory framework for the dividend policy and the provisions laid down by the regulators. The necessary information pertaining to the divided policy as per the legislations was retrieved from the policy documents and categorised further for the analysis. Finally, the collected information in the form of a document as per different categories was used as primary data for the content analysis. Our analysis found that dividends declared by companies were largely guided by the board's long-term strategy. Further, looking from the investors' perspective, having in place a dividend distribution policy for companies has probably not addressed their needs.

Keywords

Dividend policy, retained earnings, SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015, dividend payout

[1]National Institute of Securities Markets (NISM), Raigad, Near Navi Mumbai, Maharashtra, India
[2]Institute of Public Enterprise, Hyderabad, Telangana, India

Corresponding author:
Shweta Mehrotra, Institute of Public Enterprise, Survey No. 1266, Shamirpet (V&M), Medchal, Malkajgiri, Hyderabad, Telangana 500101, India.
E-mail: shwetamehrotra@ipeindia.org

Introduction

The distribution of dividends by firms remains a quandary for finance researchers because of its implications on the various aspects of a corporation and its stakeholders (Black, 1976). Indeed, the relationship between dividend policy and investment decisions has been a subject of extensive study in the field of finance (Fama, 1974). The literature on ownership and dividend policy in the corporate sector is vast and varied. One early study on the topic is the work of Modigliani and Miller (1958), who developed the concept of the 'cost of capital' and its implications for corporate investment and dividend decisions. Their work laid the foundation for much of the subsequent research in this area. Black (1976) famously referred to the 'dividend puzzle'—the observation that firms often pay dividends even though they could potentially use the cash for reinvestment opportunities. Lintner's work in 1956 indeed made significant contributions to the understanding of dividend policy. This puzzle has been the subject of much research, with Lintner (1956) offering one of the first elucidations for the payment of dividends through his 'bird in the hand' theory, which suggests that investors prefer the certainty of a dividend payment to the uncertain future value of retained earnings. Researchers such as Franco Modigliani, Merton Miller and John Gordon, known for their seminal work in dividend policy, provide different views on dividend policy and the other matters allied thereof. The traditional approach propounded by Modigliani and Miller (1958) views dividend decision as irrelevant of firm value. Contrary to this, the modern scholars view dividend policy as important decisions impacting the value of firms (Gordon, 1963). One theory advocates the payment of high dividends, and another school of thought opposes it considering the risk-taking ability of the investors. The significance and implication of a dividend policy cannot be overlooked.

It is more pertinent to an economy like India, where concentrated ownership structure is a predominant shareholding pattern (Balasubramanian & Anand, 2013; Chakrabarti et al., 2008; Claessens et al., 2002). Such type of shareholding pattern may have two implications. The principal block holders, as major shareholders, have a strong motivation to enhance shareholder value by addressing agency conflicts and aligning manager and shareholder interests (Bukart, 1997; Jensen & Meckling, 1976). Furthermore, it offers significant opportunities for large shareholders, particularly directors and promoters, to have increased incentives and control over a company's financial decisions, particularly with regard to dividends. A well-defined and transparent dividend policy is crucial as it conveys positive signals to shareholders and reflects positive corporate performance. On the other hand, a lacking or vague dividend policy, or a failure to adhere to it during dividend declaration, negatively impacts the securities market by shifting investment decisions away from dividends and towards trading gains. In view of the above discussion, this study intends to assess the contents of dividend policies of listed companies on whether the policies enunciated by the companies are based on the parameters laid down in the regulation and provide a critical review of the assessment of the dividend distribution policy by the companies as mandated by Regulation 43A over a period of five years ever since the introduction of this requirement. By filling the research gaps in the study of dividend policy in India, scholars can provide valuable insights for policymakers, corporate managers, investors and other stakeholders. Such research can help optimise dividend policy decisions, improve corporate governance practices and enhance investor confidence in India's financial markets.

Objectives

The objectives of the study are to examine (a) whether the dividend policies enunciated by listed companies are as comprehensive as required by the regulator, (b) whether the dividend declared was in accordance with the policy and (c) whether the policy comprised all the parameters prescribed by the regulators.

Literature Review

As research in corporate finance continues to evolve, there may be further exploration into the nuances of dividend policy in different organisational contexts. In the Indian context, a few studies have analysed the dividend behaviour of corporate firms. However, previous studies suggest that there is a rapidly growing body of research on dividend policy, with most studies concentrated in the USA and UK. Despite this, many questions regarding dividend decision-making remain unanswered, particularly in emerging markets (Pinto et al., 2020). Aivazian et al. (2003a) posited that the organisation of capital markets plays a crucial role in determining dividend policy, as companies operating in countries with well-developed capital markets are more likely to pay dividends and have higher dividend payout ratios. This observation is supported by Ferris et al. (2009), who found that firms in countries with strong shareholder protection and well-developed capital markets tend to have higher dividend payout ratios. Taxation also plays a significant role in determining dividend policy, as Ferris et al. (2009) found that firms in countries with high levels of personal taxation tend to have lower dividend payout ratios. Conversely, firms in emerging economies have been found to have a lower propensity to pay dividends and a lower payout ratio (Aivazian et al., 2003b). Glen et al. (1995) argued that this is likely due to the higher level of risk and uncertainty associated with emerging markets. Another aspect related to dividend is the determinants of dividend policy. In this regard, Kumar and Sujit (2018) conducted an empirical study of Indian firms and found that firm size, profitability and growth opportunities are important factors. Baker and Weigand (2015) identified several other factors that influence dividend decisions, including financial performance, growth opportunities, capital structure and ownership structure. Explicitly, they found that firms with higher levels of debt and those with a larger proportion of outside ownership tend to have lower dividend payout ratios. This is also supported by Guo and Ni (2008), who found that the level of institutional ownership is related to dividend policy, with firms with a higher proportion of institutional ownership tending to have a higher dividend payout ratio. There are other factors affecting dividend decisions such as the role and involvement of the board of members, especially the independent directors, in taking dividend decisions that cannot be overlooked. Gugler (2003) found that firms with a higher proportion of outside directors on their board tend to have a higher dividend payout ratio, while Gugler and Yurtoglu (2003) found that the presence of a corporate governance code is associated with a higher dividend payout ratio in German firms. Boshnak (2021) examined the impact of board composition and ownership structure on dividend payout policy in Saudi Arabian firms and found that firms with a higher proportion of independent directors and those with a higher level of family ownership tend to have a higher dividend payout ratio. Reviewing the past seminal research work relating to dividend decision provides insights into the investigation of all aspects of the subject matter as a whole and other matters allied thereof. However, while reviewing the past literature, we could not find any article on the current state of dividend policies adopted by the top Indian firms. This motivated us to investigate to what extent the companies are following the best practices in terms of their dividend policy.

Research Design

The research approach employed is prefaced on specific paradigms of unobtrusive research methods, including conceptual and document analysis. Unobtrusive research refers to methods of gathering data which do not intervene with the subjects under study (because these methods are not obtrusive). It is a kind of qualitative content analysis commonly used for analysing qualitative data. There is an ongoing demand for effective and straightforward strategies for evaluating content analysis studies (Rani & Salanke, 2023). In the context of this study, unobtrusive research was necessary to collect data without interacting with the subjects (Maroveski, 2016). Data analysis is done through an in-depth analysis of the dividend policy documents of listed firms.

For the purpose of this study, the top 200 companies by market capitalisation as on 31 March, 2021 (NSE) are selected, which covers 40% of the top 500 companies in terms of number and 88.77% in terms of market capitalisation as on the said date. The scope of the study covers whether these companies have developed their dividend distribution policies covering the individual parameters as stipulated by the said Regulation 43A and whether there is any relationship between dividend behaviour and dividend policy. The information relating to dividend distribution policy, dividend paid, dividend payout ratio, stock splits, bonus issues and listing dates in the case of new entrants during the period 8 July 2016 to 31 March 2021 (referred to hereinafter as the 'review period') into the top 200 companies as per NSE Market Capitalisation was taken from the following sources: (a) website of National Stock Exchange (NSE), (b) website of respective companies to the extent information is available and (c) website of Money Control. To conduct a content analysis, the authors used a three-step methodology to collect the dividend policy documents and thus evaluate their content. First, we revisited the regulatory framework in India for the dividend policy and the provisions laid down by the regulators. The necessary information pertaining to the divided distribution policy as per the provisions of the legislation was retrieved from the policy documents and categorised further for the analysis. Finally, this file was used as the primary data for the content analysis. The results of the content analysis are discussed in the next section.

Results and Discussion

Before the analysis, the descriptions of the statistics of the select companies in terms of the number of companies listed during the review period, corporate actions such as the split of shares and bonus issuance by the companies and non-payment of dividend in terms of banking and other than non-banking sectors are mentioned below. During the review period, 25 companies got listed and entered the top 200 companies by market capitalisation. These companies were required to comply with the provisions of Regulation 43A from the date of their respective listing. During the review period, some of the companies carried out corporate actions in the form of stock splits and bonus issues, which must have impacted the amount of dividend per share. Approximately 9% of companies have undergone sub-division of shares, leading to changes in the equity structure due to the increase in the number of outstanding shares. It is important to note that stock splitting does not affect the value of existing shares. Despite an increase in the number of shares, the underlying value of each share remains unchanged. In addition to cash dividends, companies have also undertaken the corporate action of issuing bonus shares. The Companies Act 2013 and the Companies (Share Capital and Debentures) Rules 2014 outline the provisions for the issuance of bonus shares through section 63 and rule 14, respectively. The Act imposes certain conditions for the issuance of bonus shares, including that they may be issued out of free reserves, securities premium account or the capital redemption reserve account, but cannot be issued as a substitute for dividends. The details of the number of stock splits and bonus issues are provided in Table 1.

There are several reasons for firms to pay dividends such as to signal firms' earnings quality, to return profits that are not required for investment outlays to shareholders. The companies can indicate their current situation and prospects to outside investors in the form of dividend payment and, thus, reduce information asymmetry between insiders and outsiders (Aharony & Swary, 1980; Asquith & Mullins, 1983). Therefore, it is always beneficial for a company to declare dividends. There are quite a few companies where dividends were not distributed. Non-payment of dividend appears to signal poor financial performance or

Table 1. Corporate Actions Taken by the Companies.

	Split of Shares (No. of Companies)	Bonus Shares (No. of Companies)
Top 100 companies	8	20
Top 101–200 companies	9	16
Top 200 companies	17	36

Table 2. Dividends Skipped by the Companies.

	Banks	Other than Banks
Top 100 companies	2	4
Top 101–200 companies	3	9
Top 200 companies	5	13

inadequacy of profits. This analysis implies that dividend omissions have information content in that these firms expect lower earnings for the future. Most companies, that is, 90%, have a good track record of payment of dividends. The details of companies that skipped dividend payment in all years of the review period are provided in Table 2.

While looking further into details, we found around one-fifth of companies default in one or more than one year for the payment of dividend, signalling poor financial performance or inadequate funds. In this regard, banking companies attributed the reason(s) for skipping dividend to the RBI (Reserve Bank of India).

Compliance with the Legal Provisions

It is the responsibility of the companies to implement the dividend policy keeping in view the provisions of SEBI's LODR Regulations and the Companies Act 2013. The purpose of the policy is to lay down in broad terms the external and internal factors including financial parameters that will be considered while deciding on the distribution of dividend, the circumstances under which shareholders of the company, may or may not expect dividend and the policy relating to retention and utilisation of earnings. Defining the objectives of the policy is an important aspect while formulating it quantifies its purpose. However, it is observed that quite a lot of companies (almost 22.5% of the companies selected) have not stated the reasons for not mentioning the objectives while formulating the dividend distribution policy. It may imply that these firms formed their policy just to comply with the regal requirements (Table 3).

As regards the companies that have specified the objects of adoption of dividend distribution policy, a perusal of the objective as stated by the companies reveals that, by and large, the following are the objects that have been adopted in the policy:

- Establish the parameters to be considered by the Board for recommending/ declaration of dividend.
- Ensure the right balance between quantum of dividend payment and retained earnings, or preservation of balance between expectation of shareholders and the company's needs for growth.
- Endeavour a consistent approach for dividend payout and provide for long-term appreciation.
- Apart from long-term value creation, also maintain the desired liquidity and leverage plus protection interest of all stakeholders.
- Ensure compliance of Regulation 43A of LODR and the provisions of Companies Act, 2013.

Table 3. Number of Companies That Did Not Define the Objective of the Policy.

	No. of Companies	%
Top 100 companies	14	7
Top 101–200 companies	31	15.5
Top 200 companies	45	22.5

We found only four companies, including three in the top 100, have mentioned that the objective of the Dividend Distribution Policy follows Regulation 43A of the LODR. The Regulation also mandates that the dividend distribution policy needs to specify the circumstances under which the shareholders of the listed entities may or may not expect a dividend. The research studies argue that there could be various circumstances affecting dividend decisions (Jensen & Meckling, 1976; Rozeff, 1982). For example, the firms choose to finance their positive NPV (net present value) project outlays through cheaper internally generated retained earnings instead of raising costly external finance from the capital markets (Myers & Majluf, 1984). Therefore, the firms facing higher investment opportunities and, thereby, higher fund requirements will pay lower dividends to investors to reduce dependence on costly external finance raised from the capital markets (Myers, 1984). The policy statement on the circumstances under which the shareholders may or may not expect benefit investors to take a buy, hold or sell decision especially based on the first three quarters' performance. However, one of the striking aspects that have been noticed is that almost 34% have not addressed this requirement of the policy. Surprisingly, around one-third of the sample companies identified above can be considered in terms of inadequacy of transparency with respect to dividend policy. Some of the circumstances/justifications for not adhering to the dividend payment, declared by the 65% companies, are as follows:

- Necessity to conserve capital
- Inadequacy of cash balance and large forthcoming requirements that are best funded through internal accruals
- Regulatory restrictions
- Exercise of prudence to conserve capital for future needs or contingencies
- Alternate forms of distribution of surplus as if there are proposals for buy-back
- Requirement of higher working capital for long-term purposes
- Restrictions/covenants in the loan agreement with the lenders
- Funds required for significant expansion project or acquisition or joint venture
- Inadequacy of profits or losses
- Inability to meet long-term financial requirements, debt service obligations and other liabilities
- Adverse market conditions and business uncertainty

Table 4. Number of Companies Not Disclosing Financial Parameters.

	No. of Companies	% of Selected Sample
Top 100 companies	17	8.5
Top 101–200 companies	19	9.5
Top 200 companies	36	18.0

Another important aspect of dividend decisions is the consideration of financial parameters as they involves the outflow of cash. In this regard, the Regulation clearly requires the dividend distribution policy to include the financial parameters based on which dividend will be paid. It is noticed that out of the sample selected for study, 18% have not clearly disclosed the financial parameters based on which dividend will be declared/paid, as detailed in Table 4.

From an analysis of the various financial parameters stated by those companies that have disclosed these parameters, it is noticed that the following financial parameters are given weightage for the determination of the amount of the dividend to be paid:

- Current earnings
- Setting off unabsorbed losses and/or depreciation of prior years
- Earning outlook for the next 3–5 years
- Cash balance and cash flow
- Plans for mergers and acquisitions
- Funds required for additional investments in subsidiaries, JV's and associates
- Capex and investment plans
- RBI norms for banks
- Corporate actions such as rights, bonus, buy-backs etc.
- Debt service coverage ratio (DSCR), debt repayment schedule and financial leverage ratio
- Impact of dividend on debt equity ratio
- Past dividend trends include interim dividend
- Sustainability of dividend payout ratio in future
- Estimate of contingency requirements
- Probability of crystallisation of contingent liabilities

Requirement to transfer to debenture redemption reserve, capital redemption reserve and any other statutory reserve which reduces the availability of profits available to the equity shareholders

Dividend payout ratios of comparable companies

There is ample research work on internal and external factors affecting the dividend decisions (Pinto et al., 2020). For example, Mueller (1972) argues that every company has a well-defined life cycle, and the firm's dividend payment decision varies across its different life-cycle stages. Mature firms have fewer investment opportunities, more accumulated earnings and less systematic risk and, thus, pay more dividends to investors (Denis & Osobov, 2008). The

Table 5. Identification and Disclosure of Internal and External Factors Affecting Dividend Payout.

	No. of Companies	% of Selected Sample
Top 100 companies	3	1.5
Top 101–200 companies	52	26.0
Top 200 companies	55	27.5

Table 6. Number of Companies Not Disclosing Internal and External Factors.

	No. of Companies	% of Selected Sample
Top 100 companies	10	5
Top 101–200 companies	10	5
Top 200 companies	20	10

distribution of dividends is also affected by the level of free cash flow. In fact, it reduces the excess of free cash flow in the hands of managers, thereby reducing the agency problem (Jensen & Meckling, 1976). External factors such as changes in the macro-economic environment also affect the dividend decision (Pandey, 2022). The Regulations require the dividend distribution policy to identify the internal and external factors to be considered for declaration of dividend separately. From an understanding of Regulation 43A of LODR as prescribed by SEBI, it appears that since the financial parameters are separately prescribed, the internal and external factors that influence the dividend recommendation and declaration should be other than financial parameters. However, it is noticed that in the case of 55 companies, though the financial parameters and internal and external factors have been covered, they have been merged under the same head. The details are given in Table 5.

As regards the inclusion of the internal and external factors that must be considered for declaration of dividends in the dividend distribution policy, it has been noticed that in the case of 20 companies, these have not been specifically disclosed (Table 6).

The companies that have addressed this requirement have *inter alia* disclosed the following internal and external factors:

- Significant changes in the macro-economic environment affecting India or in the geographies where the company is operating
- Business cycles and long-term and short-term industry outlook
- Policy, tax and regulatory changes
- Significant change in business or technological environment
- Capital adequacy requirement stipulated by RBI in the case of banks
- Prevailing capital market conditions
- Dividend declared by peers and prevailing market practices with respect to dividend
- Contractual obligations
- Requirement of research and development projects

Table 7. Number of Companies Not Disclosing the Policy on Utilisation of Retained Earnings.

	No. of Companies	% of Selected Sample
Top 100 companies	16	8.0
Top 101–200 companies	16	8.0
Top 200 companies	32	16.0

Table 8. Number of Companies with Commitment Regarding Dividend Payment.

	No. of Companies	% of Selected Sample
Top 100 companies	11	5.5
Top 101–200 companies	5	2.5
Top 200 companies	16	8.0

Another important requirement is with respect to stating in the dividend distribution policy how the retained earnings will be utilised. There are various aspects pertaining to the retained earnings. For instance, Higgins (1972) finds evidence that larger firms are less dependent on internal funds as they have an advantage in raising external funds from the capital markets. Therefore, retention of profit would be less. We found that 32 companies do not mention in the policy about utilisation of retained earnings (Table 7).

In the case of companies that disclosed the policy with respect to utilisation of retained earnings, it is observed that that companies disclosing their policies regarding the utilization of retained earnings prioritize various strategies aimed at fostering growth, financial health, and shareholder value. The common purposes outlined for utilizing retained earnings include developing new products, conducting research and development, or investing in subsidiaries, joint ventures (JVs), or associates. Some companies also cited the reasons for the buy-back of shares for ploughing back of profit, while a few companies retained their earnings for meeting requirements of long-term working capital and repayment of debts. It is noticed that some companies have given clear commitment/indication regarding dividend payment as part of the dividend distribution policy, subject of course to applicable statutory provisions. The details are given in Table 8.

The commitment/indication given regarding dividend by these companies are along the following lines:

- Minimum dividend payout as a percentage of profits after tax available to equity shareholders ranging from 15% to 40%
- A few companies have committed to pay dividends at the lower of 5% of net worth or 30% of profits after tax available to equity shareholders
- Minimum dividend payout of 10% of consolidated profits after tax
- Minimum dividend payout of 40% of consolidated profits after tax subject to availability of standalone profits
- With reference to leverage and free cash flow calculations

Table 9. Dividend Commitment Versus Actual Dividend Paid by the Companies.

	March 2016	March 2017	March 2018	March 2019	March 2020	March 2021
Dividend paid as per the dividend policy	9	6	6	7	4	5
Dividend criteria not met as per the dividend policy, so dividend not paid	5	8	8	7	10	9

In the case of two banks, not exceeding 40% of profits after tax is subject to RBI guidelines

It is quite admissible that a company may not fulfil its commitment towards dividend payment. There are merely 16 companies that mentioned their dividend commitment in dividend policy. We studied 14 companies' dividend payout behaviour post the dividend policy. As per Table 9, all sample companies adhere to their commitment.

Companies with Deficiencies in the Dividend Policy

SEBI has prescribed five broad parameters on which the dividend policy is expected to have made policy statement/disclosure. However, based on the above analysis, an observation is made in our sample data that companies are identified with at least one or two deficiencies in making policy statements on various parameters prescribed by SEBI in their policy. A summary of observations is given in Table 10.

It is very interesting to note that one-third of companies are falling short on account of not clearly specifying circumstances under which the shareholders of the listed entities may or may not expect a dividend. Twenty per cent of the companies have not specified the objectives of the policy. Moreover, nearly one-fifth of the companies did not disclose the financial parameters based on which dividend will be paid (Table 11).

There are quite a few identified companies with more than one discrepancy while framing their policies. There are 34 companies with two or more deficiencies in incorporating policy statements on prescribed parameters. No company was found deficient in all five parameters except Nestle, with four deficiencies. Nestle Ltd. prepared a policy statement on the objective of the policy but was found wanting on the other four parameters. Thirty-eight companies did not make a policy statement on how retained earnings will be used. In view of the above results and discussion, it is notable that there is a large proportion of the companies disregarding the parameters required by the regulators. The purpose of disclosing the dividend policy is to provide clarity to shareholders regarding the distribution of dividends and to aim at promoting transparency. However, by and large it appears that the dividend payouts are guided by a consideration of the board's long-term strategy. In fact, looking from the investors' perspective, having in

Table 10. Number of Companies with at Least One Deficiency.

Sr. No.	SEBI-prescribed Parameter on Which Policy Statement Is Expected	Number of Companies Falling Short
1	Companies which have not specified the objective of the dividend distribution policy	45
2	Companies which have not clearly specified the circumstances under which the shareholders of the listed entities may or may not expect dividend	68
3	Companies which have not clearly disclosed the financial parameters based on which dividend will be paid	36
4	Companies which have not specified the internal and external factors in the dividend distribution policy	20
5	Companies which have not specified how the retained earnings will be utilised in the dividend distribution policy	32

Table 11. Number of Companies with Two or More Than Two Deficiencies.

Sr. No.	SEBI-prescribed Parameter on Which Policy Statement Is Expected	Number of Companies Falling Short
1	Companies which have not specified the objective of the dividend distribution policy	10
2	Companies which have not clearly specified the circumstances under which the shareholders of the listed entities may or may not expect dividend	18
3	Companies which have not clearly disclosed the financial parameters based on which dividend will be paid	20
4	Companies which have not specified the internal and external factors in the dividend distribution policy	12
5	Companies which have not specified how the retained earnings will be utilised in the dividend distribution policy	18

place a dividend distribution policy on the part of companies has probably not addressed their needs.

Conclusion and Future Implications

The topic of dividends continues to generate significant discussion and merits thorough examination. The dividend policy is intended to reward shareholders by allocating a portion of profits for distribution, while retaining sufficient funds for future business needs and growth prospects, considering external factors such as the national economy and the financial strength of the company and its material subsidiaries. Based on the perusal of the dividend distribution policy documents of selected top 200 companies and the dividends declared by them, after considering the earnings available for equity shareholders, stock splits, bonus issues and requirement of internal accruals for company's operations, by and large it appears that the dividend payouts are guided by a consideration of the board's long-term strategy. From an investor perspective, however, having in place a dividend distribution policy on the part of companies has probably not addressed their needs of what returns can be clearly expected from an investment in these companies. In fact, most companies have not clearly indicated what dividend can be expected by the investors. Perhaps, SEBI may consider mandating a greater clarity in the dividend distribution policy. However, the bigger questions that remain from a regulatory perspective are: Are the dividends declared in conformity with the adopted policies? Has there been a departure from the policy and whether such departures are disclosed in the directors' report? These questions relating to compliance and governance can be better addressed by providing a framework for independent review on an annual basis. Perhaps the way forward is to stipulate a requirement for the companies to disclose either in the directors' report or in the corporate governance report about any departure from the dividend distribution policy and the reasons for the same. Further, the regulations may provide for a minimum commitment on dividend, subject to compliance of identified statutory requirements and review of the compliance of the dividend distribution policy by an independent professional.

Acknowledgement

The authors are grateful to the anonymous referees of the journal for their extremely useful suggestions to improve the quality of the article. Usual disclaimers apply.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding

The authors received no financial support for the research, authorship and/or publication of this article.

ORCID iD

Shweta Mehrotra Https://orcid.org/0000-0002-7229-199X

References

Aharony, J., & Swary, I. (1980). Quarterly dividend and earnings announcements and stockholders' return: An empirical analysis. *The Journal of Finance*, *35*(1), 1–12.

Aivazian, V., Booth, L., & Cleary, S. (2003a). Dividend policy and the organization of capital markets. *Journal of Multinational Financial Management*, *13*(2), 101–121.

Aivazian, V., Booth, L., & Cleary, S. (2003b). Do emerging market firms follow different dividend policies from US firms? *Journal of Financial Research*, *26*(3), 371–387.

Al-Najjar, B., & Kilincarslan, E. (2017). Corporate dividend decisions and dividend smoothing: New evidence from an empirical study of Turkish firms. *International Journal of Managerial Finance*, *13*(3), 1–38. https://doi.org.10.1108/IJMF-10-2016-0191

Asquith, P., & Mullins, D. W. (1983). The impact of initiating dividend payments on shareholders' wealth. *Journal of Business*, *56*(1), 77–96.

Baker, H. K., & Weigand, R. (2015). Corporate dividend policy revisited. *Managerial Finance*, *41*(2), 126–144.

Balasubramanian, B. N., & Anand, R. (2013). *Ownership trends in corporate India 2001–2011: Evidence and implications* (IIM Bangalore Research Paper No. 419). http://doi.org.10.2139/ssrn.2303684

Black, F. (1976). The dividend puzzles. *The Journal of Portfolio Management*, *2*(2), 5–8.

Black, F., & Scholes, M. (1974). The effects of dividend policy on common stock prices and returns. *Journal of Financial Economics*, *2*, 1–22.

Boshnak, H. A. (2021). The impact of board composition and ownership structure on dividend payout policy: Evidence from Saudi Arabia. *International Journal of Emerging Markets*. https://doi.org.10.1108/IJOEM-05-2021-0791

Burkart, M., Gromb, D., & Panunzi, F., (1997). Large shareholders, monitoring, and the value of the firm. *The Quarterly Journal of Economics*, *112*(3), 693–728.

Chakrabarti, R., Megginson, W., & Yadav, P. K. (2008) Corporate governance in India. *Journal of Applied Corporate Finance*, *20*, 59–72.

Claessens, S., Fan, J. P., & Lang, L. H. (2006). The benefits and costs of group affiliation: Evidence from East Asia. *Emerging Markets Review*, *7*(1), 1–26.

Fama Eugene, F. (1974). The empirical relationships between the dividend and investment decisions of firms. *The American Economic Review*, *64*(3), 304–318.

Ferris, S. P., Sen, N., & Unlu, E. (2009). An international analysis of dividend payment behavior. *Journal of Business Finance and Accounting*, *36*(3–4), 496–522.

Glen, J. D., Karmokolias, Y., Miller, R. R., & Shah, S. (1995). *Dividend policy and behavior in emerging markets: To pay or not to pay*. In IFC Discussion Paper. The World Bank. http://agris.fao.org.agris-search/search.do?recordID=US2012421063

Gugler, K. (2003). Corporate governance, dividend payout policy, and the interrelation between dividends, R&D, and capital investment. *Journal of Banking and Finance*, *27*(7), 1297–1321. https://doi.org.10.1016/S0378-4266(02)00258-3

Gugler, K., & Yurtoglu, B. B. (2003). Corporate governance and dividend pay-out policy in Germany. *European Economic Review*, *47*(4), 731–758. https://www.sciencedirect.com/science/article/pii/S001429210200291X

Guo, W., & Ni, J. (2008). Institutional ownership and firm's dividend policy. *Corporate Ownership and Control*, *5*(2), 128–136.

Higgins, R. C. (1972). The corporate dividend-saving decision. *Journal of Financial and Quantitative Analysis*, *7*(2), 1527–1541.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, *3*(4), 305–360.

Kumar, B. R., & Sujit, K. S. (2018). Determinants of dividends among Indian firms: An empirical study. *Cogent Economics and Finance*, *6*(1), 1423895. https://doi.org.10.1080/23322039.2018.1423895

Lintner, J. (1956). Distribution of incomes of corporations among dividends, retained earnings, and taxes. *The American Economic Review*, *46*(2), 97–113.

Maroveski, R. (2016). *Techniques in secondary data collections: A beginners' guide*. Trafford.

Modigliani, F., & Miller, M. H. (1958). The cost of capital, corporation finance, and the theory of investment. *The American Economic Review*, *48*(3), 261–297.

Mueller, D. C. (1972). A life cycle theory of the firm. *The Journal of Industrial Economics*, *20*(3), 199–219.

Myers, S. C. (1984). The capital structure puzzle. *The Journal of Finance*, *39*(3), 574–592.

Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, *13*(2), 187–221.

Pandey, S. (2022). An empirical study of the movement of sectoral indices and macroeconomic variables in the Indian stock market. *IMIB Journal of Innovation and Management*, *1*(2), 82–93

Pinto, G., Rastogi, S., Kadam, S., & Sharma, A. (2020). Bibliometric study on dividend policy. *Qualitative Research in Financial Markets*, *12*(1), 72–95. https://doi.org.10.1108/QRFM-11-2018-0118

Rani, A., & Salanke, P. (2023). A bibliometric analysis on business and management research during COVID-19 pandemic: Trends and prospects. *IMIB Journal of Innovation and Management*. https://doi.org.10.1177/ijim.221148834

Rozeff, M. S. (1982). Growth, beta and agency costs as determinants of dividend payout ratios. *Journal of Financial Research*, *5*(3), 249–259

Original Article

Power and Influence in Leadership: A Discussion from the View of Collective Action

IMIB Journal of Innovation and Management
3(1) 104–118, 2025

DOI: 10.1177/ijim.241274390
jim.imibh.edu.in

Anna-Vanadis Faix[1] **and Stefanie Kisgen**[1]

Abstract

Power and influence are important factors and are closely linked to leadership and our acceptance of it. However, in the relatively recent systematic examination of these phenomena and their emergence and implementation, at least some facets remain underexamined. The focus is primarily on psychological incentive systems. In our article, we want to argue that this form of consideration is important, but not sufficient and sometimes even remains one-sided. This is due to the restriction of the incentive systems themselves, which primarily change the consequences of actions for the guided one or are related to the guided person's lack of access to knowledge, for example. We, therefore, want to argue in favour of an extension of the theory and clarify as a core thesis why the power and influence of leadership also go hand in hand with the simplification of collective actions, fairness and cooperation. We want to realise this project at all levels on the basis of arguments from action theory (primarily decision and game theory).

Keywords

Coordination, decision theory, game theory, conflict avoidance, fairness, cooperation

Introduction

Power and influence are factors that have always been seen as somehow desirable in our society. However, in addition to the eternal desire of some to gain influence

[1]School of International Business and Entrepreneurship (SIBE), Herrenberg, Germany

Corresponding author:
Anna-Vanadis Faix, School of International Business and Entrepreneurship (SIBE), Kalkofenstr. 53, 71083 Herrenberg, Germany.
E-mail: afaix@steinbeis-sibe.de

and have power, both factors are essential, especially with regard to a management task or leadership.[i] Both—exercising certain forms of power and having influence—are implicit social requirements of a broad catalogue of tasks in leadership and management. This concerns not only the concrete assertion of something (e.g., by an employee) but also a far-reaching facet of interpersonal or social behaviour. This social aspect demands specific characteristics from managers, all of which seem to be in a field of tension: it is expected that you motivate employees or those you lead, but that you never lose your assertiveness in the process. You should act correctly and ethically but never lose sight of the criteria of efficiency. You should remain fair while radiating confidence, security and commitment.[ii] The list seems long and illustrates how complex the social areas affected by leadership and its power and sphere of influence are. Even if the practical examination of the phenomenon of power and influence is probably much older, the first attempts to systematise it in the field of leadership are a fairly recent development. Psychological theories for categorising and understanding power and influence are becoming increasingly popular, particularly in the field of management, and courses for learning about them are enjoying great popularity.[iii]

However, the existing approaches often remain on a purely psychological descriptive level or even become a form of psychological sleight of hand that illustrates how to read and control those being guided.[iv] In this article, we will attempt to broaden our view of the power and influence of leadership. This does not mean that psychological approaches are obsolete or even to be criticised in their entirety. Rather, the perspective on power and influence in leadership will be supplemented by specific systematic endeavours. The literature review (Chapter 4) will therefore provide an overview of prevailing theories of power and influence. We will then show what our objectives are (Chapter 5) in our examination of power and influence and present the theoretical basis of our argument (Chapter 6). For the methodological basis, we will then take a look at game and decision theory itself (Chapter 7), in order to clarify which gaps power and influence can fill through leadership (Chapter 8). This is followed by a discussion (Chapter 9), the conclusion (Chapter 10) and the implications for leadership and management (Chapter 11). Below are the imitations (Chapter 12) of the work, which also emphasise once again that our article is a theoretical-philosophical argument and not a conclusive empirical study.

Review of Literature: The Orthodox View of Power and Influence

In order to be able to understand and possibly expand on power and influence, it seems sensible to take a look at classical approaches as a first step. The relatively recent debate is already characterised by a wealth of theories and approaches, including the examination of social systems,[v] communication in the media[vi] and the discussion in various areas.[vii] Since the entire variety of approaches and theories are too broad, we will limit ourselves here to better understanding the general thrust of these theories.[viii] In general, Dahl (1957, p. 202), for example, understands power as follows: 'My intuitive idea of power is something like this: A has power over B to do not something what B would otherwise do'. Influence, on the other hand, can be understood as the change in opinions, attitudes or behaviour through the influence of others.[ix]

One of the best-known theories on the development of power and influence, by French and Raven (1959), can now be considered as an example. This approach still describes an important foundation with far-reaching influence today. According to French and Raven (1959), the focus is on the assumption that power represents a didactic relation between agents, which can be viewed from different angles. Accordingly, power and influence are described by a person P and his individual view. Power and influence are exerted from person O on person P. Influence and power are generally defined in terms of psychological changes that are triggered by this and are assumed to be two components that act on a system. Whereby the system (a) can be changed in a desired direction and (b) can generate appropriate resilience. The theory itself focuses on the changes within an observed system, while all other social factors and conditions are assumed to be constant. Along these assumptions, French and Raven (1959) postulate five observable forms of power that can influence each other, but are based on different systemic hypotheses:

1. Reward power: O has the property of being able to reward P for desired behaviour.
2. Punishment/coercion power: P assumes that O can punish her for undesired behaviour.
3. Legitimate power: P assumes that O has a legitimate right to demand a certain behaviour from him based on more complex social assumptions, such as (a) cultural values (age), (b) structures (majority voting) or (c) labels (professional position).
4. Power through Identification: P identifies with O (desire for unity).
5. Expert power: P assumes that O has special knowledge.

In this context influence also arises through the development of power. Schematisation describes important relationships and it is not without reason that it continues to be of central importance today. Nevertheless, the general argumentation is partially one-sided if one considers leadership and the required catalogue of characteristics in their entirety. Because leadership, when exercised appropriately, requires power and influence.[x] The forms of power described can be subsumed under various formulations of incentives or sanctions (also in the motivational sense). This can be indirectly compared with corresponding incentive systems in decision and game theory. Here, for example, the preferences of an actor can be (subsequently) changed by penalties or incentives as described above.[xi] For example, actor A might prefer to go on holiday by plane rather than by car or train (A has the following preference order: A > B > C). If travelling by plane were associated with corresponding sanctions[xii] (by a person who wants to exercise power) this can shift the preferences accordingly to: B > A > C and actor

A would then decide to go on holiday by car. On this basis, such incentive and punishment systems are often utilitarian or consequentialist in nature and entail some pitfalls.[xiii]

This is the case because the actor's evaluation level is changed, which relates exclusively to the consequences of his action. However, if the actor has a different motivational basis that determines or co-determines his action, such incentive systems need not influence or change his preferences. In such a case, French and Raven's (1959) power and influence do not necessarily lead to power and at least do not cover all possible forms of power. Furthermore, empirical data show that changing the preferences of actors via, for example, sanction or incentive systems can often lead to so-called micro-sabotage.[xiv] If the management does not take such factors into account, this can lead to the wrong undesirable results in the long term and suggest power and influence, but not generate them in a stabile manner. Such forms of power and influence in hierarchical form can also lead to certain exploitative structures.[xv] At the very least, it can be summarised that such a theoretical approach is very important, but cannot be conclusive.

Objectives

The two main theses and goals are the following: First, it should be made clear that it seems sensible to broaden the perspective on power and influence (in an interdisciplinary way), as existing contributions do not reflect the entire wealth of these phenomena in the field of leadership.[xvi] Second, an attempt will be made to look at power and influence from the perspective of collective action (or game theory). The focus is on the latter. The argumentation aims to illustrate that power and influence are helpful on a fundamental level to ensure a quick and easy decision-making process in collective decision-making situations. The argumentative approach of the article is limited to discussions of (rational) decisions. This means that mainly arguments and examples from game theory, decision theory and collective action are used. The argumentation is purely theoretical and philosophical and not statistical. This is intended to broaden the facets of the phenomena of power and influence in the field of leadership with a corresponding, additional perspective.

Theoretical Frameworks: Leadership as Solution for Collective Action

Instead of focusing on individual incentive systems, there are approaches in decision and game theory that concentrate on and help us understand collective actions.[xvii] There are many different discussions and theories in this area, the complexity of which would go beyond the scope of this article.[xviii] At this point, it is sufficient to look at the case of simple action coordination and expand on it for the present argumentation of the perspective of power and influence among leaders.[xix] The focus shifts from incentive systems that are already based on fixed motivations for action (e.g., avoidance of punishment) on the part of the person in charge to open systems of action.[xx] In the first step, the argument aims to show that leadership functions as a simple solution for collective action and can thus generate power and influence. King et al. (2009, p. 914) already indicated the central importance of leadership as a simple solution strategy in collective action situations. Similar remarks can also be found in Harsanyi (1962, p. 82), because '[p]ower relations became relevant in social groups when two or more individuals have conflicting preferences and decision has to be made as those to whose preferences shall prevail'.

Coordination between actors now also applies to game theory, in which actors choose their actions according to their preferences given the actions (and preferences) of others. So-called equilibria are decisive here, in which players cannot improve their actions by choosing a different strategy.[xxi] Strategic combinations are considered Pareto-optimal if none of the players can improve without making another worse off.[xxii] In interaction situations, there can now be various coordination problems between the actors involved. Lewis (1969) describes this in the example of an interrupted call. Two actors A and B are having a telephone conversation and this is suddenly interrupted. Both actor A and B can now either try to call the other again or wait for the other to call again. If both call again at the same time, the call is not made (busy). If neither of them calls the other again, the call cannot be continued. The two have no opportunity to coordinate, which leads to the following preference matrix with two equilibria (marked bold).[xxiii]

Furthermore, coordination can take place under conflict if actor A and B want to meet for a café and cake, for example, and agree that one will bring cake and one will bring café, whereby both prefer to bring café, as this is less work. We still get two equilibria.

In both cases, this is sometimes an epistemic problem that can be resolved to a certain extent through agreements or conventions.[xxiv] Often, however, no real agreements are possible or conventions predetermined, and these problems are exacerbated by the growing number of players involved.[xxv] Let us extend the first example and assume an interrupted online conference or a group telephone call consisting of a number n of participants who all have to coordinate their actions as described. In most cases, the problem with real online conferences with a large number of participants does not arise in individual action decisions, conventions or even individual agreements among all participants. Rather, there is an implicit agreement that one of the participating players will take the 'lead' over the online channel and conference

Table 1. Simple Coordination (see e.g., Lewis, 1969, p.12).

	A Calls Back	A Waiting for Call
B calls back	0/0	**1/1**
B waiting for call	**1/1**	0/0

Table 2. Coordination with Conflict (see e.g., Schelling, 1960, p.126).

	A Brings Coffee	A Brings Cake
B brings coffee	0/0	**1/2**
B brings cake	**2/1**	0/0

access. In this extended sense, leadership can describe a simple solution for collective actions, which becomes more important as the number of participants in collective actions increases. The agreement does not require a permanent exchange between all participants, but it is sufficient to know that the person in question is acting in the interests of everyone in order to avoid problems in this regard as far as possible. The coordination of all persons n involved is bundled via the knowledge and agreement of all that one person from n will coordinate this accordingly. In the event of conflict (example two), the premise is added that this person not only acts in the interests of all, but also does so as fairly as possible (especially in the long term). Through this acceptance, the leading person gains power and influence (e.g., via online access to the conference), subject to corresponding additional structures and responsibilities. The determination of an equilibrium between the actors is sufficient to exert power and influence and does not have to be contrary to the original preferences of the actors. This is particularly important when coordination is viewed in terms of conflict or cooperation.

Methodology

The methodology of game and decision theory itself, as well as its philosophical analysis in a normative context, is fundamental to the consideration and argument in favour of leadership from the perspective of collective action. The formal conditions are considered on the basis of the properties of binary relations. X is a non-empty, finite set whose elements are the alternatives x, y, z etc. that are to be decided upon (X = {x, y, z, ...}). The alternatives are mutually exclusive. The following relations between the elements x and y of a set of alternatives are relevant at this point:

- xPy, strict preference: x is strictly preferred to y; also x > y,
- xRy, weak preference: y is not preferred over x; also x ≥ y,
- xIy, indifference: Neither x nor y is preferred; also x ~ y only if x ≥ y and y ≥ x.

If the weak preference (as a basic relation) fulfils the following two conditions, the preference relations of an agent can be mapped in the form of a utility function that maps the series of ordinal values:

- Completeness (connectivity): R is complete $\Leftrightarrow \forall x, y \in X : xRy \vee yRx$,
- Transitivity: R is transitive $\Leftrightarrow \forall x, y, z \in X : xRy \wedge yRz \wedge xRz$.[xxvi]

Then u is a function of x according to $\mathbb{R}$, which maps the preference relation R to ordinal values, so that $u(x) \geq u(y) \Leftrightarrow x \geq y$ exactly when R is complete and transitive and the corresponding person maximises her utility along with her preferences. This can be described by the following selection function U, which selects the alternative(s) from the set $S \subseteq X$ for which no better alternative exists in S:

$$U((S,R)) = \{X \in S \mid \neg\exists y \in S \; yPx\}$$ [xxvii]

The formal conditions can also be used or extended for an analysis under probabilities. This means that decisions can also be modelled under uncertainty.[xxviii] Game theory builds on decision theory by extending it to interactions between two or more people. The classical understanding of the game indirectly includes the intention of each player to achieve the best possible outcomes according to their preferences—always given the actions of the other players. The normal form of a game is represented as a triple *(I, S, U)* as follows:

$$\left(I,(S_i)_{i\in N,}(U_i)_i\right)$$

Here $I=\{1,\ldots n\}$ denotes the set of players and S_i the set of strategies (possible actions) of the players i. The strategy space S specifies the set of all possible strategy combinations s = (s_1, s_2,..., s_n) from the strategies of the individual players, that is, $s \in S$. Here, U_i(s) reflects the utility of player i when a strategy combination i is played (utility function U= (U_1,..., U_n)). If a certain strategy combination s is played in a game, this results in the benefit combination U(s).[xxix] A strategies $s_i \in$ S is dominant for i $\in$ I, if and only if $\forall s \in S:[U_i(s|s_i) > U_i(s)]$. And weakly dominant when $\forall s \in S:[U_i(s|s_i) \geq U_i(s)]$. A strategy profile s* $\in$ S is an equilibrium point (Nash equilibrium) if $\forall i \in I: \forall s_i \in S_i:[U_i(s^*) \geqq U_i(s^*|s_i)]$.

Analysis: Power and Influence Through Coordination and Conflict Reduction

So far, it has been explained how classical approaches usually do not reflect all forms of power and influence and attempts have been made to show that leadership can primarily simplify collective actions, which indirectly entails power and influence. In the following, the previous argumentation will be put into a corresponding form and further supported by arguments. But how can power and influence be generated from this attribution of leadership itself? First, it is helpful to clarify more precisely how leadership simplifies actions in the collective case. Let us return to the example of the online conference, in which leadership facilitates general coordination (without conflict). This 'facilitation' is achieved by the fact that no agreement between all participants or conventional regulation of online access needs to be created. The fact that everyone (group g) wants to participate in the online conference appears to be an (implicit or explicit) collective goal u(g), which can be achieved more quickly and easily by leadership. Provided that it represents this common goal in the interests of all (and their preferences) or even generates this goal in the first place (e.g., through a conference invitation or the idea for the online conference). Power and influence then do not arise through specific access, rewards or sanctions in the form of subsequent changes to the consequences (and thus possibly the preferences) of those involved, but through the epistemic simplification of the situation for all actors in order to achieve u(g). In this case, power is not opposed to the original preferences of the actors, but is associated with a clear definition and possibility of organisation. Accordingly, these are specific forms of power and influence.[xxx]

In the simpler two-person case of the telephone call, there are two equivalent equilibria (1/1) between the actors, which only need to be coordinated to an arbitrary equilibrium. Leadership coordinates a group g in such a way that a common goal u(g) can be achieved as far as possible in line with the preferences of each individual group member without individual agreement between all of them or generates u(g) in the first place. The group g then accepts this goal/coordination through the attribution of power and influence. The attribution of power and influence takes place through the simpler achievement of a common goal and arises with the confidence to realise this accordingly. In cases of conflict (café cake example), this coordination towards a common goal u(g) of a group g of n participants becomes even more difficult. However, this is not related to more difficult coordination between the participants, but to the question of the common goal. Even in the simple two-person example, there are two equilibria that need to be coordinated. However, these are unequally valued by the participants. One of the participants has to draw the short straw here and bring the cake with additional effort so that an equilibrium can be achieved at all and the common goal of meeting for a café and cake can be realised (otherwise everyone's preferences will be worse off). In situations involving a larger group g, this imbalance can become even more complicated. When coordinating a common goal u(g) in the interests of the group and the individual preferences of the participants, fairness must be ensured in the long term so that the interests of all participants are given equal consideration.

In the two-person case, this could mean that if player A brings a café the first time, the next time they have to take care of the cake (or other additional work). In a group g with n participants, leadership not only simplifies coordination, but also fairness in the long term towards achieving a common goal u(g). This is necessary so that everyone participates in a common goal in the long term, because anyone who is treated unfairly will distance themselves from it.[xxxi] To achieve this fairness, individual group members must be prepared to sacrifice their own preferences (bring cake) due to the power of the leadership. The attribution of power and influence to leadership is supplemented here by other factors that affect fairness in the interests of all and thus ensure the achievement of a common goal between them. Finally, the more complex case of cooperation should be mentioned here. Cooperation is therefore more complex, as in a two-person case both actors have to distance themselves from their own preferences in order to achieve a better result together (cf. prisoner's dilemma).[xxxii] Leadership and the acceptance of the collective goal of the participants can generate cooperation here

Table 3. Prisoner`s Dilemma (see e.g., Nida-Rümelin, 2019, p. 63).

	A Cooperation	A Defection
B cooperation	3/3	1/4
B defection	4/1	**2/2**

(which is better for everyone in the long run), whereby the equilibria of the original game can be found as follows:

This will not be explained further here, as it would lead to a very broad general discussion. However, it should be pointed out at this point that leadership also simplifies cooperation in the sense mentioned. Cooperation can only come about if none of the actors involved exploits the other's willingness to cooperate in the interests of their own preferences (free riders). Here, leadership can not only have a helpful coordinating effect (epistemic mediation), but can also identify free riders in the interests of all and, for example, punish them, create appropriate conditions and thus ensure the achievement of the common goal u(g)—which in this case would be the cooperative solution—in the long term. Power and influence would then be ascribed through the attribution of the guarantee of cooperation, which involves individuals stepping back from their original preferences (defection). In conclusion, it can now be summarised that leadership in the following cases is granted and attributed power and influence by a group g:

1. For the possible generation of a common goal u(g).
2. To coordinate a common goal u(g).
3. To ensure fairness in reaching u(g).
4. To maintain cooperation in the sense of u(g).

Power and influence is ceded to leadership in order to achieve the collective goal more easily and to reduce conflicts. The power and influence of a leader grow with good coordination, fairness, cooperation and, for example, other appropriate punishment in the event of deviation in the interests of all.[xxxiii]

Discussion

The argument of the perspective of power and influence in leadership is limited to collective decisions in the game theory case. The formal representation of collective choice has been disregarded here and not considered in detail.[xxxiv] The psychological perspective is also not taken any further, as this has been sufficiently analysed in the literature. Similarly, the argument is not that cooperation and coordination along the preferences of actors or a group cannot come about by themselves, but that leadership extremely simplifies and facilitates both cases by attributing each participant. This may be an obvious factor, but one that is ignored in any consideration of power and influence. The analysis here is focussed on the two-way relationship between leader and follower and what added value power and influence can generate from leadership.

Conclusion

In the argumentation presented above, an attempt has been made to show that although classic approaches to power and influence are important tools and theories, they do not represent all the basic outlines of the phenomena. Accordingly, we tried to expand power and influence in terms of the attribution of leadership to include an additional perspective that seems fundamental. It was argued that the attribution of power and influence in leadership goes hand in hand with the simplification of coordination, fairness and the maintenance of cooperation. Or even create and generate a common goal in the first place. A group ascribes power and influence to a leader—in the sense of imposing punishments for deviations or distributing tasks—in order to better achieve common goals. If leadership is coordinatively simplifying, fair and focused on the functioning of joint cooperation, it is able to assert power and influence in the long term. Otherwise, power and influence will be denied (see also micro-sabotage). This is the case, for example, if one or more players feel unfairly treated in the group in the long term, because then the influence decreases and the power of a person is questioned accordingly.[xxxv] This does not seem to replace classical psychological approaches in any way, but it is another aspect if we want to understand power and influence in leadership in its entirety. At the very least, this requires further discussion.

Managerial implications

The implications for management theory and practice can be read directly from the results. Power and influence are crucial for achieving and advancing goals in an organisation. This shows that previous approaches to power and influence are limited, usually only effective in the short term and can even lead to losses for the organisation itself and the manager in the long term. Accordingly, the results that make it clear that power and influence go hand in hand with the coordination and cooperation of collective preferences of those involved appear to us to be crucial. Power and influence are generated here on the basis of a simple epidemic gap, as well as extended by fairness relationships and the regulation of the group in the interests of all. Good leadership therefore requires much more than psychological means to generate power and influence, but must always have the goals of all those involved in an organisation in mind. Based on the argument presented, power and influence and leadership or management positions in organisations can therefore be gained in the long term through:

1. The generation of common goals (new goals)—especially through (disruptive) innovations that create them.[xxxvi]
2. The coordination of this in the sense of a goal accepted by all (given their preferences in the long term).
3. Compliance with fairness in coordination and constant, transparent communication of the procedure here (conflict avoidance).
4. Generate cooperation between all to achieve the common goal (even if this means favouring a common consensus over the participants' own preferences—structurally advantageous in the long term).

Limitations

Unfortunately, some questions must remain unanswered at this point. For example, the question arises in detail of how an individual actor generates the preferences in a group towards a common goal in the first place and when this is successful and when not. Beyond simplified systems, the question must also be asked how humans understand fairness in detail and what we rationally perceive as fair or unfair.[xxxvii] When is power recognised in this context? The extended discussion of cooperation also remained very limited at this point for reasons of space. It remains questionable how leadership can contribute in detail to cooperative goals, their generation and realisation and how it can better contribute to their maintenance. There are certainly a number of factors here that have been overlooked up to now and help to develop a better understanding of power and influence in this context. Questions include, for example, when we do or do not accept means to enforce cooperation towards a common goal. We also need to take a closer look at our general understanding of leadership and its definition.[xxxviii] It also remains to be seen how psychological approaches can be adequately integrated here. The application at this point is feasible and quite interesting. It shows which forms of punishing power, for example, are accepted by followers and when they lead to micro-sabotage and loss of trust instead. The results are closely linked to the results presented here and need to be expanded accordingly. The argument is also based on a philosophical level and requires an extended empirical-statistical examination. Regardless of the many unresolved questions and problems, as well as the possible transfer to concrete leadership situations in practice, we hope to be able to show that the phenomena play a role in a broader context and that this can contribute to an understanding in connection with leadership.

Acknowledgement

The authors are grateful to the anonymous referees of the journal for their extremely useful suggestions to improve the quality of the article. Usual disclaimers apply.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding

The authors received no financial support for the research, authorship and/or publication of this article.

Notes

i. Cf. Scholl (2014).
ii. HR today (2023).
iii. See, for example, Harvard Business School (2013) or for newer theories, for example, Durupinar et al. (2011), Collins and Raven (1969) or Hollander (1964).

iv. Ibid.
v. Cf. Parson (1963).
vi. Ibid.
vii. Cf. Bierstedt (1950), p. 730.
viii. See further, for example, Zündorf (1987), Dahl (1957), Crott (1983) or Schneider (1977) for an overview and classification of different approaches here. Also, Henderson (1981, p. 73), for example, distinguishes only four different main groups of power conceptions. Neuberger (1985), on the other hand, divides the approaches into structural and personalised conceptions. One of the reasons for this is that the attribution of personality attributes has long been the focus of research. Further criteria of division can be found in Pollard and Mitchell (1972), who distinguishes between (a) the analysis of the means of power, (b) the focus between realised and potential power, (c) the inclusion of the situation and (d) the reaction of those affected in the theory landscape. An overview of the evaluation of the various theories of power and influence, on the other hand, can be found in Schopler (1965), while a classification in the social sciences is made by Sander (1990), for example. In the latter, the focus is on the search for regularity stemming from a social reality outside the individual.
ix. Whereby the definition always refers to social influence. Cf. Dorsch Lexikon der Psychologie (2023).
x. Cf. Homann und Suchanek (2005).
xi. Or the epistemic access to states of knowledge or positions that an actor does not possess himself, but another does.
xii. This sanctioning can, but does not have to be of a monetary nature, it is only important that it shifts the preferences and their evaluation by the actor through incentive or sanctioning systems. An alternative example would be sanctioning with a prison sentence, etc.
xiii. Moreover, utilitarian and consequentialist interpretations are much criticised in their own right at this point. See, for example, Von Kimakowitz et al. (2011) or Nida-Rümelin (1997).
xiv. See, for example, Yasir et al. (2020).
xv. See, for example, Bagchi and Sharma (2024).
xvi. This is also meant in a sense that goes beyond the argumentation presented in the text. Even if the argumentation here is limited to this and to the theory of action.
xvii. Theories of collective action themselves are also helpful here.
xviii. Some key approaches can be found in Tuomela (2007) and Nida-Rümelin (2019), among others
xix. The more complex case of cooperation is not discussed further here. However, it can be included in a correspondingly extended discussion when it comes to leadership tasks.
xx. These also offer the possibility of being interpreted in a variety of motivational or normative ways.
xxi. Cf. Kreps (1988), p. 65.
xxii. Ibid.
xxiii. The figures only reflect the assessment of the preference order. The higher the number, the higher the preference.
xxiv. Cf. Lewis (1969).
xxv. See, for example, Paternotte (2011).
xxvi. See Kern and Nida-Rümelin (1994).
xxvii. See Kern and Nida-Rümelin (1994).

xxviii. This extension is not relevant in the sense of the consideration made here and further requires the axioms of continuity and independence in order to depict the expected utility, for example, according to von Neumann and Morgenstern (1944).

xxix. The set of all permissible combinations of benefits for all $s \in S$ is denoted by:

$$P = \{U(s) | s \in S\} = \{U_1(s), \ldots, U_n(s)\}.$$

xxx. Cf., for example, the following approaches: Couzin et al. (2005), Wilson (1975) or De Waal (2005).

xxxi. On fairness and the importance of participation in collective action, see, for example, from an evolutionary perspective De Waal (2019) or Tomasello (2009).

xxxii. See, for example, Tuomela (2007, 2013) or Nida-Rümelin (2019).

xxxiii. This can also be further supported by empirical data and existing considerations from decision theory. See, for example, Camerer (2003), King et al. (2009) or Mesoudi (2008).

xxxiv. See, for example, Kern and Nida-Rümelin (1994).

xxxv. Cf. De Waal (2005).

xxxvi. This is based on the concept of innovation discussed in, among others Faix (2022).

xxxvii. So, there is a wide debate about what we think is fair and what is not. See, for example, Fenton (2021).

xxxviii. See, for example, Faix et al. (2021), Greenleaf (1998) or Haslam et al. (2005) for the different definitions of leadership. Kisgen (2017) provides an overview here and illustrates how many different theories and approaches there are in this regard.

ORCID iDs

Anna-Vanadis Faix https://orcid.org/0000-0002-7720-7574
Stefanie Kisgen https://orcid.org/0000-0002-6278-6323

References

Bagchi, S. N., & Sharma, R. (2024). Disempowered by leadership: Tales from the middle of the organizational pyramid. *IMIB Journal of Innovation and Management*, *2*(2). https://doi.org/10.1177/ijim.241245799

Bierstedt, R. (1950). An analysis of social power. *American Sociological Review*, 15. https://psycnet.apa.org/doi/10.2307/2086605

Camerer, C. F. (2003). *Behavioural game theory. Experiments in strategic interaction*. Princeton University Press.

Collins, B. E., & Raven, B. H. (1969). Group structure: Attraction, coalitions, communications, and power. In G. Lindzey & E. Anderson (Eds.), *The handbook of social psychology* (Vol. *IV*, pp. 102–203). Addison-Wesley.

Couzin, I. D., Kruase, J., Franks, N. R., & Levin, S. A. (2005). Effective leadership and decision-making in animal groups on the move. *Nature*, 433. https://doi.org/10.1038/nature03236

Crott, H. (1983). Macht. In D. Frey & S. Greif (Eds.), *Sozialpsychologie. Ein Handbuch in Schlüsselbegriffen* (pp. 231–238). Urban & Schwarzberg.

Dahl, R. A. (1957). The concept of power. *Behavioural Science*, 2. https://doi.org/10.1002/bs.3830020303

De Waal, F. (2005). *Der Affe in uns. Warum wir sind, wie wir sind*. Deutscher Taschenbuch Verlag.

De Waal, F. (2019). *The age of empathy. Nature`s lessons for a kinder society*. Souvenir Press.

Dorsch Lexikon der Psychologie. (2023). *Einfluss*. Retrieved December 13, 2023, from https://dorsch.hogrefe.com/stichwort/einfluss-sozialer

Durupinar, F, Pelechano, N., Allbeck, J., Güdükbay, U., & Badler, N. (2011). How the ocean personality model affects the persecution of crowds. *IEEE Computer Graphics and Applications*, *31*(3). https://doi:10.1109/MCG.2009.105

Faix, A.-V. (2022). Qualitative Innovation in the light of the normative: A minimal approach to promoting and measuring successful innovation in business. *IMIB Journal of Innovation and Management*, *2* (2). https://doi.org/10.1177/ijim.221091004

Faix, W. G., Kisgen, S., Schwinn, A., & Windisch, L. (2021). *Führung, Persönlichkeit. Bildung. Mit Führungskraft die Zukunft erfolgreich und nachhaltig gestalten*. Springer.

Fenton, B. (2021). *To be fair. The ultimate guide to fairness in the 21th century*. Mensch Publishing.

French, J. R. P., & Raven, B. (1959). The basis of social power. In D. Cartwright (Ed.), *Studies in social power* (pp. 529–569). University of Michigan Press.

Greenleaf, R. K. (1998). *The power of servant leadership*. Berrett-Koehöer Publisher, Inc.

Harsanyi, J. C. (1962). Measurement of social power in n-person reciprocal power situations. *Journal of Science*, *7*. https://doi.org/10.1002/bs.3830070106

Harvard Business School. (2013). Power and influence for positive impact. Retrieved January 1, 2024, from https://account.myhbx.org/s/login/?startURL=https%3A%2F%2Faccount.myhbx.org%2F&PC=PIPI

Haslam, S. A., O`Brien, A., Jetten, J., Vormedal, K., & Penna, S. (2005). Taking the strain: Social identity, social support, and the experience of stress. *British Journal of Social Psychology*, *44*. https://doi.org/10.1348/014466605X37468

Henderson, A. H. (1981). *Social power. Social psychological models and theories*. Praeger Publishers

Hollander, E. P. (1964). Leadership and power. In G. Lindzey & E. Aronson (Eds.), *Handbook of social psychology* (Vol. *II*, pp. 485–537). Random House.

Homann, K., & Suchanek, A. (2005). *Ökonomie: Eine Einführung*. Mohr Siebeck.

HR today. (2023). Macht oder Einfluss. Retrieved December 10, 2023, from https://www.hrtoday.ch/de/article/macht-oder-einfluss-leader-erreichen-ihre-ziele-durch-gekonnte-status-spiele

Kern, L., & Nida-Rümelin, J. (1994). *Logik kollektiver Entscheidungen*. De Gruyter Verlag.

King, A., Johnson, D. D. P., & Vugt, M. V. (2009). The origins and evolution of leadership. *Current Biology*, *19*(19). https://doi.org/10.1016/j.cub.2009.07.027

Kisgen, S. (2017). *The future of business leadership education in tertiary education for graduates*. Steinbeis-Edition.

Kreps, D. M. (1988). *Notes on the theory of choice*. Taylor & Francis Group.

Lewis, D. K. (1969). *Convention: A philosophical study*. Wiley-Blackwell.

Mesoudi, A. (2008). An experimental simulation of the “copy-successful-individuals” cultural learning strategy: Adaptive landscapes, producer-scrounger dynamics, and informational access costs. *Evolution and Human Behavior*, *29*. https://doi.org/10.1016/j.evolhumbehav.2008.04.005

Neuberger, O. (1985). *Führung*. Enke.

Nida-Rümelin, J. (1997). *Economic rationality and practical reason*. Springer.

Nida-Rümelin, J. (2019). *Structural rationality and other essays on practical reason*. Springer.

Parson, T. (1963). On the concept of influence. *The Public Opinion Quarterly*. https://doi.org/10.1086/267148

Paternotte, C. (2011). Being realistic about common knowledge: A Lewisian approach. *Synthese*, *183*(2). https://doi.org/10.1007/s11229-010-9770-y

Pollard, W. E., & Mitchell, T. R. (1972). Decision theory analysis of social power. *Psychological Bulletin*, *78*(6), 433–446.

Sander, K. (1990). *Prozesse der Macht. Zur Entstehung, Stabilisierung und Veränderung der Macht von Akteuren in Unternehmen*. Springer.

Schelling, T. C. (1960). *The strategy of conflict*. Harvard University Press.

Schneider, H.-D. (1977). *Sozialpsychologie der Machtbeziehungen*. Enke.

Scholl, W. (2014). Führung und Macht: Warum Einflussnahme erfolgreicher ist. Humboldt Universität Berlin. Retrieved December 12, 2023, from https://www.artop.de/fuehrung-und-macht-warum-einflussnahme-erfolgreicher-ist/

Schopler, J. (1965). Social power. *Advances in Experimental Social Psychology*, *2*, 177–218.

Tomasello, M. (2009). *Why we cooperate*. The MIT Press.

Tuomela, R. (2007). *The philosophy of sociality. The shared point of view*. Oxford University Press.

Tuomela, R. (2013). *Social ontology: Collective intentionality and group agents*. Oxford University Press.

Yasir, H., Asrar-ul-Haq, M., Amin, S., Noor, S., Haris-ul-Mahasbi, M., & Alsam, M. K. (2020). Corporate social responsibility and employee performance: The mediating role of employee engagement in the manufacturing sector of Pakistan. *Corporate Social Responsibility and Environmental Management*, *27*, 2908–2919.

Von Kimakowitz, E., Pirson, M., Dierksmeier, C., Spitzeck, H., & Amann, W. (2011). Introducing this book and humanistic management. In E. von Kimakowitz & M. Pirson (Eds.), *Humanistic management in practice*.

Von Neumann, J., & Morgenstern, O. (1944). *Theory of games and economic behavior*. Princeton Classic Editions. Princeton University Press. Palgrave Macmillan.

Zündorf, L. (1987). *Macht, Einfluss und Vertrauen – Elemente einer soziologischen Theorie des Managements*. Arbeitsbericht Nr. 31 des Fachbereichs Wirtschafts- und Sozialwissenschaften.

Author Bio-sketch

Anna-Vanadis Faix is a philosopher and economist. She is currently a research assistant and doctoral candidate at the Ludwig Maximilian University of Munich. She previously studied philosophy and economics at the University of Tübingen, the University of Padova and the University of Cambridge.

Prof. Dr Stefanie Kisgen, Junior Professor of Leadership at Steinbeis University. Managing Partner of the School of International Business and Entrepreneurship GmbH (SIBE) at Steinbeis University with currently approx. 400 students in Master's programmes in the areas of Business & Law and more than 5,000 graduates. Studied Regional Studies China at the University of Cologne and Nanjing Normal University / China (Dipl.-reg. - 2004). Career integrated postgraduate studies for a Master of Business Administration at the SIBE of Steinbeis University Berlin (MBA - 2007). Part-time doctorate (Dr. phil.) at the Ludwigs-Maximilians-Universität (LMU) Munich (2017) on the topic 'The Future of Business Leadership Education in Tertiary Education for Graduates'.

Original Article

Exploring the Landscape of Digital Nudging: A Comprehensive Bibliometric Analysis Using VOSviewer

IMIB Journal of Innovation and Management
3(1) 119–133, 2025

DOI: 10.1177/ijim.241288031
jim.imibh.edu.in

Merliyn Anna Thomas[1] and Jyothis T.[1]

Abstract

In recent years, digital nudging, which is based on human-computer interaction and behavioural economics, has received much attention as a means to influence users' behaviour in digital environments. There has been a notable proliferation of scholarly investigations within diverse academic disciplines related to the concept of digital nudge and its implementation in real-life contexts. However, there remains a significant gap in the comprehensive understanding of the current state of research on digital nudging and its future directions. This article offers an extensive bibliometric analysis of the digital nudging literature by examining 1,713 publications sourced from the Scopus database, covering the period from 2008 to mid-2023. This study outlines trends in digital nudging publications, identifies the most pertinent sources and highlights frequently used keywords. A bibliometric analysis using VOSviewer was subsequently performed to uncover thematic clusters. The co-authorship network analysis of authors and countries, the co-occurrence of specific keywords and author-level co-citation analysis reveal notable patterns and themes within the field of digital nudging. This study serves as a valuable resource for gaining a comprehensive understanding of recent research developments in digital nudging.

Keywords

Digital nudge, choice architecture, bibliometric analysis, Scopus, VOSviewer

[1]Department of Commerce, St. Thomas College, Kozhencherry, Kerala, India

Corresponding author:
Merliyn Anna Thomas, Department of Commerce, St. Thomas College, Kozhencherry, Kerala 689672, India.
E-mail: merliynannathomas2021r@stthomascollege.info

Introduction

The term nudge was coined by behavioural economist Richard Thaler and law professor Cass R. Sunstein in their book ‘Nudge’. They define the concept of nudge as ‘any element of choice architecture that predictably influences people's behavior without eliminating any options or significantly altering their economic incentives’ (Thaler & Sunstein, 2008). Studies in psychology and behavioural economics have demonstrated that numerous psychological factors impact individuals' decision-making processes, whether they are aware of it or not (Thaler et al., 2013). Decisions are often heavily influenced by the context in which they are made, meaning that the environment plays a significant role (Thaler & Sunstein, 2008). With the expansion of the digital economy, an increasing number of decisions are being made through digital platforms, such as screens (Weinmann, Schneider & Brocke, 2016). The decision environment is important here because decisions in the digital sphere are strongly influenced by the design of the user interface like the website or the mobile app. Digital nudging becomes important in online shopping because customers can't physically see or touch products. As a result, other elements of the website like pictures, graphics and videos play a crucial role (Tomar, 2023). The decision made by a user is affected not only by their logical thinking as a human being, but also by the way the choice environment is designed, in which information is provided. (Weinmann, Schneider & Brocke, 2016).

A growing number of studies on nudge have been conducted, including systematic reviews and meta-analyses. But research on nudging on digital context is only on its nascent phase. Despite the fact that research into digital nudge is currently a hot topic, there is still a lack of analysis on the connections between the composition, development and collaboration of the body of existing knowledge and the identification of promising areas for future study. This article employs bibliometric analysis to explore the field of digital nudges, focusing on publication trends from 2008 to mid-2023, the most commonly featured journals and keywords and the leading research disciplines and thematic clusters in nudge studies. It also highlights areas of digital nudging that need further investigation and outlines potential directions for future research. The findings will benefit behavioural scientists, researchers, decision makers and higher education institutions by identifying research hotspots and emerging trends in nudging, guiding their future research endeavours.

This article is structured in the following way: The second section introduces the key concepts of digital nudging. The third section outlines the strategies used for data extraction and literature analysis. The fifth section displays the key results of the bibliometric analysis. The sixth section discusses the gaps in current research and potential avenues for future studies. The eighth section summarises the analysis outcomes, while the ninth section wraps up the study. Finally, the tenth section addresses the constraints and limitations of the research.

Theoretical Framework

Digital Nudging

Thaler and Sunstein (2009) introduce the concept of nudging as a way to influence human behaviour by deliberately designing choice environments, based on principles from behavioural economics. However, human decisions are never made in isolation; instead, they occur within a context where various visible and hidden factors can exert influence (Thaler, Sunstein & Balz, 2010). Decision architects are responsible for designing these environments, and they have the power to alter them by subtly guiding or nudging individuals towards making better choices. The concept of nudging is rooted in behavioural economics, which, through empirical research, has shown that people often make irrational decisions and behave irrationally due to social, emotional and cognitive influences (Thaler & Sunstein, 2009).

Nudges are interventions in choice environments that either exploit certain heuristics and biases or aim to counterbalance them. According to the concept of libertarian paternalism, nudges should be easy to avoid, beneficial to the decision-maker and should preserve the individual's freedom of choice (Thaler & Sunstein, 2009). Hansen (2016) defines a nudge as any effort to systematically influence a person's judgment, choice or behaviour that meets two criteria: (1) it is enabled by cognitive limitations, biases, routines and habits in both social and individual decision-making, which can hinder people from acting rationally in their own stated interests; and (2) it functions by leveraging these very limitations, biases, routines and habits as key elements of the influence attempt.

The dual process theory, which suggests that individuals use two separate cognitive systems – reasoning and intuition – to assess information during decision-making, helps explain this phenomenon. These systems differ in the level of mental effort they require. In certain situations, people depend on the reason-based System 2, which is slower, more effortful, deliberate and controlled, while in other instances, they rely on the intuitive or perceptual System 1, which is fast, automatic, effortless and emotionally driven (Stanovich & West, 2000). Most empirical studies in this field find that daily activities are predominantly intuitive, relying on System 1 (Kahneman 2003; Kahneman 2011). According to Kahneman (2011), individuals generally do not need substantial cognitive effort for routine tasks such as using digital services (Constantiou et al. 2014), meaning System 2 is only marginally engaged in everyday activities. System 1 employs heuristics, or mental shortcuts, to minimise the amount of information processed, thereby facilitating and accelerating the decision-making process (Bazerman & Moore 2008).

In recent years, digital nudges have become more prevalent due to the growing number of decisions made in digital environments. While the concept of nudging is originated in political science and behavioural economics, it is also applicable in the digital realm. This is commonly known as a 'digital nudge'. Digital nudging involves utilising a digital platform – such as a website or mobile app – to influence decisions made in both digital and physical contexts.

When discussing digital nudging, it refers to the subtle use of design, informational and interactive elements to steer user behaviour in digital settings, without limiting the individual's freedom to choose. Digital environments often depend on automated processes and basic heuristics for decision-making, which simplifies the process but can also increase the likelihood of poor decisions. Digital nudging is a method that alters people's digital surroundings to affect their decision-making process and the resulting choices. The design features that influence decisions can vary widely and generally rely on different psychological mechanisms related to decision-making.

Methodology

Index Database

With technological advancements and ongoing investments in scientific research, bibliometric analysis has emerged as a solution to the limitations of traditional narrative literature reviews in evaluating academic contributions, assessing study merits and determining research trends in the face of a growing volume of literature. Bibliometric analysis offers a thorough and accurate way to understand the interconnectedness of journal citations and summarise the most recent advancements in ongoing or emerging research topics by analysing and examining enormous amounts of scientific data. This quantitative analysis of literature is becoming more common across many disciplines due to improvements in the accessibility and usability of bibliometric software and scientific databases. It provides a trustworthy and impartial approach, free from individual subjectivity and other outside influences, making it a widely accepted theory.

Table 1. Criteria Table.

Criteria	Reject	Accept
Search Date: 30-06-2023		6560
Database: Scopus		
Search Term: 'digital' OR 'online' OR 'on-line' OR 'on-screen' OR 'web-based' OR 'computer-based' OR 'user interface' OR 'UI' OR 'interface design' OR 'image' OR 'colour' OR 'color') AND ('persuasive systems' OR 'choice architecture' OR 'nudge' OR 'behavioral economics' OR 'behavioural economics' OR 'persuasive tech' OR 'gamification').		
Subject Area: Social Sciences, Business Management and Accounting, Decision Sciences, Psychology, Arts and Humanities, Economics, Econometrics and Finance	3479	3081
Document Type: Articles and Review	1131	1950
Language: English	119	1831
Year: 2008 to 2023	7	1824
Publication Stage: Final	111	1713

The bibliometric analyses in this review were carried out using the Scopus database (Baas et al., 2020). To identify relevant literature on digital nudging, a broad search was conducted using the terms 'digital nudging' and 'online'. As shown in Table 1, from the initial search, eight publications were closely reviewed to help refine and identify relevant keywords for the study. The initial search resulted in 6,560 publications. Only articles and review articles published from 2008 (till mid-2023) were selected as the concept of nudging gained significant popularity in the year 2008. After applying different inclusion and exclusion criteria as shown in Table 2, finally a total of 1713 publications were selected for the analysis.

General Descriptive Statistics

This section presents the general descriptive results of the analysis related to digital nudging, highlighting publication trends and major sources. It also specifies the inclusion and exclusion criteria used by the author to collect data from the Scopus database.

Retrieve Design Criteria

Findings

Article Publication Trends in the Field of Digital Nudging

The number of publications on digital nudge research is presented in Figure 1 which depicts the development from year 2008 to mid-2023. The increasing growth trend is supported by an increase in the number of articles published. When examining the average annual number of publications, the observed

Table 2. Inclusion and Exclusion Criteria Table.

Inclusion Criteria
Articles related to Social Sciences, Business Management and Accounting, Decision Sciences, Psychology, Arts and Humanities, Economics, Econometrics and Finance
Only articles and review articles
Published between 2008 and June 2023
Published data only
Exclusion Criteria
Book chapters
Conference articles
Conference review
Languages other than English
Articles in progress

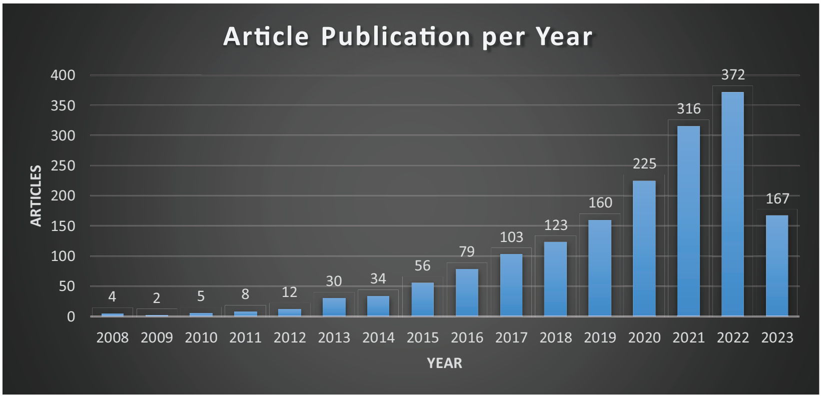

Figure 1. Annual Scientific Production.

Table 3. Most Relevant Sources.

Sources	Articles
Sustainability (Switzerland)	56
Computers in Human Behavior	35
Frontiers in Psychology	32
Computers and Education	27
International Journal of Emerging Technologies in Learning	23
Appetite	22
Education and Information Technologies	20
Education Sciences	18
Computer Applications in Engineering Education	16
Behaviour and Information Technology	15

research trend can be categorised into two distinct phases. First phase is before 2016. Before 2016, nudge research saw moderate growth during this time, with fewer than 100 publications published year. During this period, the average number of publications was about 25 per year. Second phase starts after 2016 with a rapid increasing trend which is continuing till the mid-2023. The decreasing trend (2023) in the graph is because the data is collected till mid-2023 only (6 months).

Most Relevant Sources

Nudge theory is generally applicable to decision-related studies. We discovered that publications on nudge-related research appear in a variety of journals, which point to a considerable advancement in the field. Table 3 shows the top 10 most relevant sources in the field of digital nudging. The data in the figure shows that all the sources are related to technology as the area is in digital context. Economic journals are not the most productive, despite the fact that the concept of digital nudge has evolved from behavioural economics. Human psychology and behaviour-related sources have gained high positions in the respective list.

Bibliometric Analysis

Bibliometric analysis entails the study and interpretation of citations from scholarly works using different frameworks, tools and techniques. As a result, various metrics have been created to analyse the intellectual structure of broad academic disciplines and to evaluate scientific publications, research activities and scholars in a comprehensive manner (Rani & Salanke, 2023). To show the bibliographic data visually, we used VOSviewer to examine the connections between different elements being analysed. Our current research involved conducting several types of analyses, including co-authorship, co-occurrence, bibliographic coupling and co-citation analysis. We chose VOSviewer for this study because it can generate maps using network data, bibliographic data and textual information, and it is also versatile in supporting multiple file formats. Specifically, we employed a .CSV file containing bibliographic details of the articles for visualization purposes in VOSviewer.

Word Cloud

Word clouds are a type of data visualisation where the magnitude of each word represents its frequency or importance in a textual representation. When creating a word cloud from a text, the more frequently a word appears, the bigger it is

Figure 2. Word cloud.

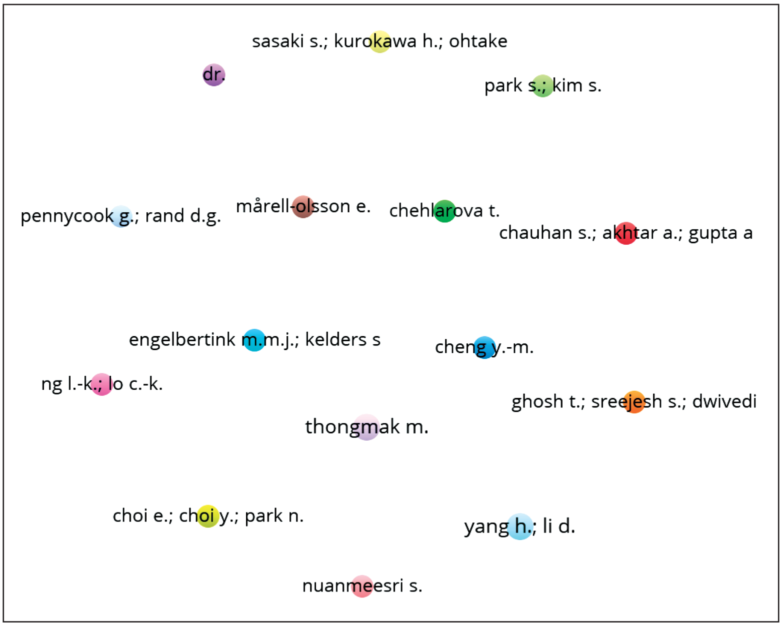

Figure 3. Co-authorship Network of Authors.

displayed in the word cloud making it more prominent in the visual presentation. Figure 2 shows the word 'human' appeared to be the most frequently used one (223 times) followed by the word 'gamification' with (214 times). Next following words include 'male', 'female', 'humans' and 'adult'. This is because the main aim of digital or technology mediated nudges is to influence the human behaviour and psychology.

6.2 Co-authorship Network Analysis of Author and Countries

The co-authorship network highlights the level of collaboration among authors, institutions and nations, resulting in a synergistic impact. Collaborative research not only generates innovative scientific outcomes but also improves the quality of research articles. Researchers frequently collaborate and contribute jointly to the development of scientific articles, which enhances both the quantity and quality of scientific output. The network analysis was performed using VOSviewer. As depicted in Figure 3, the co-authorship network consists of authors who have worked together on a minimum of two research articles. In total, 28 authors are organised into 14 clusters, each distinguished by a unique colour. The most substantial co-authorship network involves Thongmak M., Yang H. and Li D., who have collaborated on three documents. Additionally, Pennycook G. and Rand D.G. have co-authored three articles with 246 citations.

The co-authorship network in Figure 4 displays the connections between author-affiliated countries that have published at least two articles together between 2008 and mid-2023. To ensure a diverse range of countries, a minimum

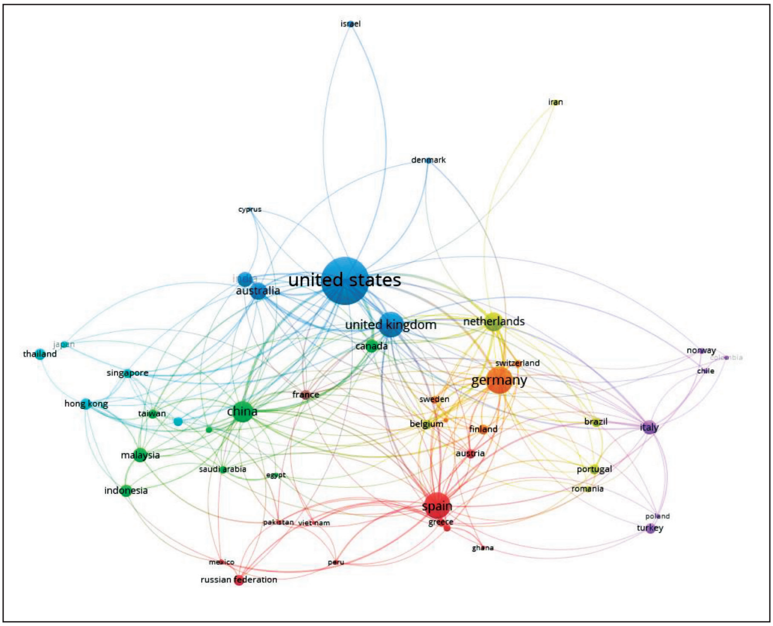

Figure 4. Co-authorship of Author Affiliated Countries.

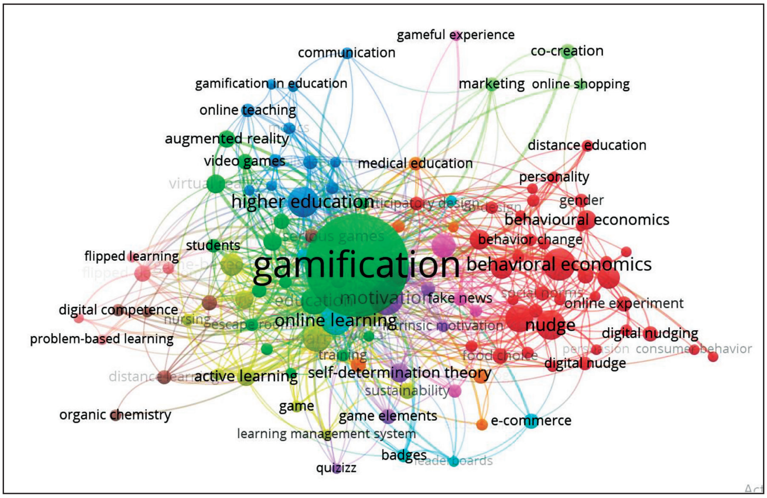

Figure 5. Co-occurrence of Author's Specific Keywords.

of 10 citations per country were set as the threshold limit, resulting in a total of 51 countries. The USA shows the highest total link strength among all the countries. There are no connections between certain countries, such as Hungary and the Philippines. However, there is a strong collaboration network between countries like the USA, Germany, the UK, the Netherlands, China and Spain.

Keyword Occurrence Network

We performed an author keyword analysis to identify the dominant thematic understanding among scholars. This analysis focused on getting a deeper understanding of the current research trends in the field of digital nudging. To study the most frequently used author keywords, we used VOSviewer version 1.6.19 to create a keyword co-occurrence network. We started with a list of 1713 articles and extracted a total of 3494 keywords. To create the co-occurrence network of the most frequently used author keywords, we limited the keywords to at least five occurrences, resulting in 117 keywords. In total, 117 keywords out of the 3494 met the criteria. The frequently used author keywords co-occurrence network is shown in Figure 5. The map reveals that the concept of 'gamification' was the primary focus of study, with 492 occurrences, followed by 'motivation' with 52 occurrences. The analysis resulted in 117 keywords grouped into 11 clusters, each cluster represented by a different colour. Author keywords analysis offers some useful insight. Firstly, most of the studies have done in the field of education to identify the learning intention among students or e-learners. Secondly, studies focusing on behaviour change, consumer behaviour, customer experience and personality in the context of e-commerce or online shopping are also growing.

Co-citation Analysis at the Author Level

We conducted co-citation analyses at the author level, and to be eligible for inclusion, an author must have been cited at least 30 times. We also used VOSviewer with the full counting method to analyse co-citation patterns, and out of the 80,236 authors, 300 authors met the threshold of 10 minimum citations. Through co-citation analysis of the cited authors, we identified six clusters, which are represented by different colours in Figure 6. This figure displays the co-citation pattern of the 300 authors who were cited at least 30 times by the studies in our sample. Cluster 1, depicted in red, comprises the work of 112 highly cited authors, making

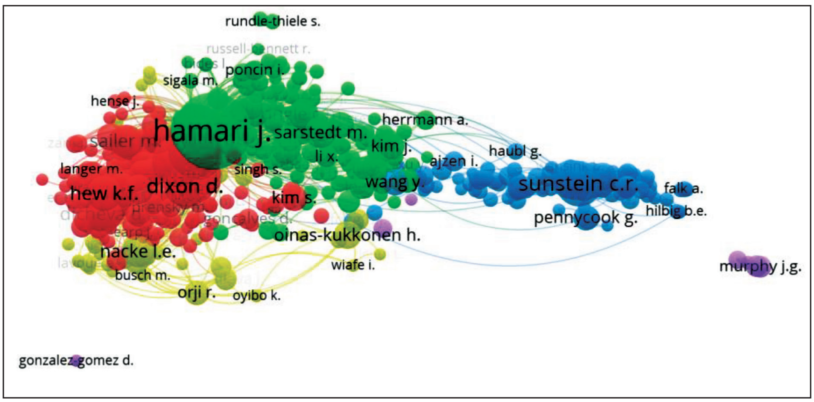

Figure 6. Co-citation of the Cited Authors.

it one of the largest clusters. Of the 112 authors, Ryan R.M. and Dixon D. are the most highly cited in the field of digital nudging. Cluster 2, in green, includes 93 authors, with Sunstein C.R., Pennycook G. and Acquisti A. being the most prominent. Cluster 3, in blue, consists of 74 authors and Hamari J. and Koivisto J. are the most highly cited. Cluster 4, in yellow, features 16 authors, including Nacke L.E., Orji R. and Tondello G.F. Cluster 5, also in yellow, comprises 3 authors, with Murphy J.G., Mackillop J. and Bickel W.K. being the most prominent. Cluster 6, in black, includes just 2 authors, with Rundle-Thiele S. and Dietrich T., being the most highly cited.

Unexplored Avenues in Current Research and Prospects for Future Research Directions

After doing a thorough evaluation of the literature, we found that while there has been ongoing advancement in the body of knowledge, there are still significant gaps in the body of knowledge that are limiting current research. We suggest a few directions for further investigation into digital nudging.

1. Dominance of experimental studies

   A review of a substantial body of literature indicates that most studies employed experimental research designs, either through laboratory experiments or by constructing dummy websites (Eigenbrod & Janson, 2018; Huang et al., 2018; Koch, 2020; Marx & Germies, 2021; Meske et al., 2020; Sharma & Cheng, 2021; Kesseli, 2021). There is a noticeable absence of descriptive and analytical research in the field of digital nudging. Future researchers should investigate more sophisticated statistical methods to improve the prediction of human behaviour and psychological processes.

2. Lack of studies measuring long-term effectiveness and sustainability

   Many studies on digital nudging focus on short-term behavioural changes. Longitudinal studies are needed to better understand the long-term impacts of digital nudging interventions. Exploring whether the impact of nudges persist over time or diminish after repeated exposure will provide insights into the sustainability of these interventions.

3. Effectiveness and generalisability

   Many investigations into digital nudging have been carried out in controlled environments or specific contexts. Future studies should aim to evaluate how effective and applicable digital nudges are across various populations, cultures, settings and dimensions. Besides the known aspects like nudge type and context of application, factors such as personality traits and prior social media usage also impact the efficacy of nudges (Schär, 2023). Exploring how different demographic variables – such as age, gender, socio-economic status, personality and emotions – affect the effectiveness of digital nudges will provide valuable insights.

4. Sampling limited to younger users

   The results from these studies highlight the growing appeal among younger individuals, particularly targeting university and college students. Nonetheless, because of the small sample sizes, these results cannot be generalised to huge population. It is recommended that future research endeavours consider individuals across different age groups and with diverse educational backgrounds in order to obtain a more comprehensive understanding.

5. Lack of studies in developing countries

   The present review highlights that majority of the studies have predominantly focused on developed countries such as the USA, the UK and Germany. The application of digital nudges and its effects needs to be studied in the context of developing countries like India, China etc too.

6. Measurement and evaluation

   Developing robust measurement tools and evaluation frameworks for digital nudging interventions is crucial. Future research should focus on the development of standardised metrics to assess the effectiveness and impact of digital nudges. This includes developing reliable methods to measure behavioural outcomes, such as engagement, adherence and sustained behaviour change.

Discussion

This section provides a summary of our current study and showcases the results of the four research questions that were introduced in the introduction. The findings for each of the four questions are listed below:

i. RQ (1) addresses the trends in research publications in the area of digital nudging from 2008 to mid-2023. The findings clearly indicate that research on digital nudging has gained significant momentum and is expected to experience rapid growth, particularly since 2020. Before 2016, the average number of publications was about 25 per year. But after that, a rapid uptake of about 170 average publications per year can be seen and the increasing trend is still continuing.
ii. The findings of RQ (2) highlighted the most relevant sources and keywords. The analysis reports that sustainability (Switzerland) journal has emerged as the most pertinent source with 46 articles. Also, the keyword 'human' appeared to be the most frequently used keywords in this area.
iii. The results of Research Question (RQ) 3 were obtained through conducting co-authorship network analysis, keyword occurrence analysis and co-citation network analysis. The co-authorship network of authors indicates that Thongmak M., Yang H. and Li D. have the strongest co-authorship network with three co-authored documents. The co-authorship of author-affiliated countries reveals that the USA has the highest total link strength

among all nations, with no linkages between countries such as Hungary and the Philippines. On the other hand, a strong collaboration network exists among countries like the USA, Germany, the UK, the Netherlands, China and Spain. Keyword occurrence network analysis resulted in a total of 117 keywords grouped under 11 clusters. It shows that most of the studies have done in the field of education to identify the learning intention among students or e-learners. Secondly, studies focusing on behaviour change, consumer behaviour, customer experience and personality in the context of e-commerce or online shopping are also growing.

The author-level co-citation analysis yielded six clusters, with the work of Ryan R.M. emerging as the most frequently cited source, followed by Dixon D., the most frequently cited author in the field of digital nudging.

v. To address RQ (4), various research gaps were identified in the body of knowledge that are limiting current research and suggested directions for future research.

Conclusion

This article offers a thorough overview of current direction of digital nudging research. The 1713 publications that were collected from Scopus were analysed using a bibliometric analysis of digital nudge to examine the publication trend, countries, authors and keyword co-occurrence. The findings indicate that, beyond the realm of behavioural economics, digital nudge research have been applied to a number of other fields. Since 2016, especially after 2020, there have been a lot of digital nudge publications, and this trend is predicted to continue. In the digital world, there is a greater need to contribute to the improvement in the well-being of those being nudged through decision-making and interface design. The study encountered several limitations in its attempt to enhance our comprehension of digital nudges from a broad perspective. Primarily, the analysis was confined to the data obtained from Scopus publications. While Scopus is known for predominantly including reputable data sources, it is not guaranteed that the data are flawless or encompass all relevant studies. As a result, it is advisable for future researchers to explore additional databases such as Web of Science, SpringerLink, EBSCO, JSTOR and others to ensure comprehensive coverage of crucial journal indexes and varying time periods. This study has another limitation whereby only publications in the English language were chosen for the analysis. Notwithstanding the aforementioned limitations, our article presents an all-encompassing review of the research on digital nudging, offering significant advantages to both scholars and professionals. The comprehensive nature of our work will facilitate the expansion and progression of research in this field, benefiting academia and practitioners alike.

Limitations

The structured literature review concentrated on the ongoing research in digital nudging, aiming to provide a broader understanding of the field. However, the study encountered some limitations. Firstly, it only included articles from Scopus, a database known for its reliable sources but not exhaustive in coverage. Future researchers are encouraged to utilise additional databases such as WoS, SpringerLink, EI and EBSCO to ensure a more comprehensive inclusion of relevant journals and time frames. Secondly, the analysis was restricted to English-language publications, which limited its scope and inclusivity. Incorporating sources in other languages could offer a fuller perspective on the topic. Lastly, the study focused on identifying general aspects and themes within digital nudging without delving into specific areas or dimensions. This indicates a need for more detailed research on various domains and aspects in future studies.

Acknowledgment

The authors would like to express their gratitude to the anonymous reviewers of the journal for their valuable suggestions, which greatly enhanced the quality of the article. Usual disclaimers apply.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding

The authors received no financial support for the research, authorship and/or publication of this article.

ORCID iD

Merliyn Anna Thomas https://orcid.org/0009-0006-9833-5475

References

Baas, J., Schotten, M., Plume, A., Cote, G., & Karimi, R., (2020). Scopus as a curated, high-quality bibliometric data source for academic research in quantitative science studies. *Quantitative Science Studies*, *1*(1), 377–386.

Bazerman, M. H., & Moore, D. A. (2008). *Judgment in managerial decision making*. Wiley.

Callon, M., Courtial, J.-P., Turner, W. A., & Bauin, S. (1983). From translations to problematic networks: An introduction to co-word analysis. *Social Science Information*, *22*(2), 191–235.

Constantiou, I., Lehrer, C., & Hess, T. (2014). Changing information retrieval behaviours: An empirical investigation of users' cognitive processes in the choice of location-based services. *European Journal of Information Systems*, *23*(5), 513–528.

Eigenbrod, L., & Janson, A. (2018). *How digital nudges influence consumers- Experimental investigation in the context of retargeting*.

Hansen, P. G. (2016). The definition of nudge and libertarian paternalism: Does the hand fit the glove? *European Journal of Risk Regulation*, *7*(1), 155–174.

Huang, N., Chen, P. Y., Hong, Y., & Wu, S. Y. (2018). Digital nudging for online social sharing: Evidence from a randomized field experiment. *Proceedings of the Annual*

Hawaii International Conference on System Sciences, 1483–1491. https://doi.org/10.24251/hicss.2018.185

Kahneman, D. (2003). Maps of bounded rationality: Psychology for behavioral economics. *The American Economic Review*, *93*(5), 1449–1475.

Kahneman, D. (2011). *Thinking, fast and slow*. New York: Macmillan.

Kesseli, S. (2021). *Detecting the effect of digital nudges on customer response in e-commerce environment* (Doctoral dissertation). Aalto University.

Koch, C. (2020). *Effect differences of digital nudging along the customer journey- A field experiment effect differences of differences of digital nudging along the customer* (pp. 59–69). AMA Accademic Summer Conference 2020. https://www.researchgate.net/publication/344459995_EFFECT_DIFFERENCES_OF_DIGITAL_NUDGING_ALONG_THE_CUSTOMER_JOURNEY_-A_FIELD_EXPERIMENT

Marx, J., & Germies, J. (2021). *Conscious commerce – Digital nudging and sustainable E-commerce purchase decisions*. 1–11.

Meske, C., Amojo, I., & Mohr, P. (2020). *Digital nudging to increase usage of charity features on e-commerce platforms digital nudging to increase usage of charity features on e-commerce platforms. March*. https://doi.org/10.30844/wi

Rani, A., & Salanke, P. (2023). A bibliometric analysis on business and management research during COVID-19 pandemic: trends and prospects. *IMIB Journal of Innovation and Management*. https://doi.org/10.1177/ijim.221148834

Schär, A. (2023). *Pre-purchase nudging: Digital nudging efficacy in the pre- purchase stage of the customer journey* (Doctoral dissertation). https://www.e-helvetica.nb.admin.ch/

Sharma, K., & Cheng, M. X. (2021). Impact of digital nudging on information security behavior : An experimental study on framing and priming in cybersecurity. *1*(1), 69–91. https://doi.org/10.1108/OCJ-03-2021-0009

Stanovich, K. E., & West, R. F. (2000). Individual differences in reasoning: Implications for the rationality debate?. *Behavioral and Brain Sciences*, *23*(5), 645–665.

Thaler, R., & Sunstein, C. (2008). *Nudge: Improving decisions about health, wealth, and happiness*. Yale University Press.

Thaler, R. H., & Sunstein, C. R. (2009). *Nudge: Improving decisions about health, wealth, and happiness*. Penguin Books.

Thaler, R. H., Sunstein, C. R., & Balz, J. P. (2013). Choice architecture. In E. Shafir (Ed.), *The behavioral foundation of policy* (pp. 428–439). Princeton University Press.

Thaler, R. H., Benartzi, S., Sunstein, C. R., & Gennaioli, N. (2013). Beware of defaults. *Journal of Economic Perspectives*, *27*(3), 47–58. doi:10.1257/jep.27.3.47.

Tomar, S. S. (2023). Factors affecting customer satisfaction in online grocery shopping : An empirical analysis. https://doi.org/10.1177/ijim.231206620

Weinmann, M., Schneider, C., & Brocke, J. vom. (2016). Digital nudging. *Business and Information Systems Engineering*, *58*(6), 433–436. https://doi.org/10.1007/s12599-016-0453-1.

Zupic, I., & Cater, T. (2015). Bibliometric methods in management and organization. *Organisational Research Methods*, *18*(3), 429–472.

Manuscript submission

- The preferred format for your manuscript is MS Word.
- The journal does not consider a paper that has been published elsewhere or that is under submission to another publisher. Authors must attest to this at the time of submission. It is also author's responsibility to disclose any potential conflict of interests regarding their submitted papers.
- Authors will be provided with a copyright form once the contribution is accepted for publication. The submission will be considered as final only after the filled-in and signed copyright form is received.

Basic formatting of the manuscripts

The journal publishes the following article types:

- Original Articles (empirical research papers on Innovation and Management-related areas)
- Review Articles
- Methodological Articles
- Case Studies
- Book Reviews

Please refer to the Submission Guidelines on the journal website for details on formatting.

Spelling and numerical usages

- Consistent use of British spelling is advised.
- Spell out numbers from one to nine, 10 and above to remain in figures. However, for exact measurements use only figures (e.g. 3 km, 9%). Please use '13th' instead of 'thirteenth century'; use '1960s' instead of 'nineteen sixties'.

Quotations, notes, tables and figures

- British English uses single quotation marks to indicate quotations or dialogue, double quotation marks for quotation inside quotation (nested quotation).
- Notes should be numbered serially and presented at the end of the article. Notes must contain more than a mere reference.
- Tables and figures must be cited in the text, and indicated by number separately (Table 1), not by placement (see Table below). Source details for figures and tables should be mentioned irrespective of whether or not they require permissions.
- All photographs and scanned images should have a resolution of minimum 300 dpi and 1500 pixels, and their format should be TIFF or JPEG. Due permissions should be taken for copyright-protected photographs/images.

References and their text citations

- References and their citations should be given in accordance with APA 7th edition.
- Please ensure that all references mentioned in the reference list are cited in the text and vice versa.

For detailed style guidelines, please visit https://jim.imibh.edu.in