

AMITY BUSINESS REVIEW

Vol. 26, No. 1, January - June 2025

Bi-Annual, Double-Blind, Peer-Reviewed & Refereed Journal of

Amity Business School

ISSN: 0972-2343

ASI-SCORE: 1.3

Indian Citation Index

Chief Patron	:	Dr. Ashok K Chauhan
Patron	:	Dr. Atul Chauhan
Desk Advisor	:	Dr. Balvinder Shukla
Editor-in-Chief	:	Dr. Sanjeev Bansal
Editor	:	Dr. Vijit Chaturvedi

Board of Editors

DR. ABDUL AZIZ ANSARI

Jamia Millia Islamia, New Delhi

DR. J.K. SHARMA

Board of Editors

PROF. GARIMA GUPTA

University of Delhi

DR. S.K. LAROIYA

Formerly University of Delhi

DR. SANDEEP KUMAR GARG

University of Delhi

PROF. MAHESH SHARMA

SBSC, University of Delhi

DR. DHARMENDRA

Guru Jhambeshwar University, Hisar

PROF. AWADHESH KUMAR TIWARI

Dean, Commerce and Management, Deen Dayal Upadhyaya Gorakhpur University, U.P

DR. TRIVENI SINGH

SP Cyber Crime, Uttar Pradesh Police

PROF. S.K. GARG

Pro Vice Chancellor, Delhi Technical University

PROF. DR AJAY KUMAR SINGH

Vice Chancellor, Sri Sri University, Cuttack

Delhi School of Economics, Delhi University

DR. SANJAY SAPROO

CEO, Respiratory Inc. USA

DR. DILIP KUMAR BANDHOPADHYAY

Former Vice Chancellor, GGSIP

PROF. DR SUDHIR KUMAR SHUKLA

HOD Commerce, Mahatma Gandhi Kashi Vidyapith, Varanasi

DR. N.K. AHUJA

Vice Chancellor, Subharti University, Meerut

PROF. JAVED AKHTAR

Aligarh Muslim University, Aligarh

PROF. T.K. CHATTERJEE

IMT Nagpur

PROF. A.H. ANSARI

Director CMS, Jamia Milia Islamia

PROF. JAGDEESH

Dean Management, Amity University, Mumbai

Doc. Dring. ELENA HORSKA

Slovak University of Agriculture, NITRA, Slovak Republic

MR. SANTOSH K SRIVASTAVA

INDOIL, MONTNEY Ltd. Calgary, Canada

DR. T. K. SINGHAL

Symbiosis International University, Pune

Message from Editor in Chief

In the present era of dynamic global transformation, economies and enterprises are experiencing an environment shaped by technological disruption, shifting trade paradigms, and evolving societal expectations. The financial performance today is no longer just a measure of profit and loss but a reflection of strategic resilience, innovation and governance excellence. It is a rising need that nations striving for economic advancement must also balance fiscal prudence with inclusive growth, ensuring that policies and practices contribute to both stability and sustainable development. As uncertainties stemming from geopolitical shifts, resource constraints, and rapid digitization persist, the focus must increasingly turn toward adaptive economic frameworks that promote collaboration, transparency, and long-term value creation.

The present developments across all verticals of growth are identified with Artificial intelligence, predictive analytics, and behavioural sciences are reshaping how leaders perceive performance, risk, and opportunity. In such a context, management education and professional practice must evolve continuously bridging traditional wisdom with contemporary innovation. It is through this lens that leadership must now operate by integrating ethical intelligence, technological agility, and social consciousness into decision-making processes.

This issue of Amity Business Review seeks to present thoughtful perspectives and research-driven discussions on emerging management paradigms that influence economic, social, and institutional progress. The contributions within exemplify the collaborative perspective of theory and practice providing insights into how leaders, policymakers, and scholars can collaboratively drive sustainable growth. Each article reflects the shared vision of building resilient, knowledge-driven systems where innovation, inclusivity, and integrity form the basis of progress in the 21st century.

Prof. (Dr) Sanjeev Bansal

Editor-in-Chief ,ABR

Amity Business Review, (ISSN: 0972-2343)

Message from Editor

In today's dynamic and technology-driven world, rapid advancements in Artificial Intelligence, Blockchain, the Internet of Things (IoT), and advanced Data Analytics are redefining the contours of modern management and organizational efficiency. These innovations are not merely tools of convenience but catalysts for strategic transformation that enables enterprises to automate processes, optimize resources, enhance decision-making accuracy, and deliver deeper value to stakeholders. As digital ecosystems expand, the ability to integrate these technologies effectively has become essential for sustaining competitiveness and achieving operational excellence in volatile global markets.

Sustained innovation which is rooted in ethical practices and visionary thinking, remains the cornerstone of long-term success and sustainability. The collaboration between researchers, practitioners, and industry leaders is therefore vital in translating emerging knowledge into impactful action. This edition of the journal presents insightful research and global perspectives across various management domains, aiming to foster adaptive, resilient, and performance-oriented organizations. The contributions herein reflect the spirit of continuous learning and innovation thus guiding readers toward strategic excellence and sustainable growth in an ever-evolving business landscape.

Prof (Dr)Vijit Chaturvedi

Editor

Amity Business Review

(ISSN: 0972-2343)

1. Audit Committee Attributes and Financial Reporting Quality: Reflection from BSE 100 Firm
- *Mr. Ragubir Sahu, Dr. Rajat Deb, Manikya Jamatia*01
2. Improving the quality of financial reports through professional ethical practices: A comparative study of listed firms in Nigeria and South Africa
- *Raimi Adekunle, Anisere-Hameed, Taiwo Olufemi, Asaolu, Olalekan Oladipo, Akinrinola*.....23
3. AI Stimuli fostering Customer Engagement and Value Co-creation Behaviour: A Comprehensive Review of Tourism Industry
- *Ipsa Bharti*38
4. Financial Performance Analysis using TOPSIS Technique: A study on select Indian Cement companies
- *Sunil Tudu and Dr. Somnath Das*51
5. Spirituality management in the pharmaceutical sector in India
- *Dr. Hamendra Dangi, Professor, Delhi University, Dr. Gurpreet Kaur, Associate Professor, Rukmini Devi Institute of Advanced Studies*62
6. Cybersecurity in Next-Generation Finance: Challenges, Opportunities, and Strategic Solutions
- *Vikas Shishodia*78

Audit Committee Attributes and Financial Reporting Quality: Reflection from BSE 100 Firm

Mr. Raghbir Sahu, Ph. D.

Research Scholar, Department of Commerce, Tripura University.

Dr. Rajat Deb.

Assistant Professor, Department of Commerce, Tripura University, Suryamaninagar-799022, West Tripura, Tripura, India.

Manikya Jamatia, Ph. D.

Research Scholar, Department of Commerce, Tripura University.

Abstract

This study examines the relationship between the characteristics of audit committees (AC) and financial reporting quality (FRQ) among India's top 100 Bombay Stock Exchange (BSE 100) firms using data from 2017-2023. Employing an ex post facto design with secondary data from the annual report, the research applies multiple regression analysis to assess the relationship between the AC and FRQ, measured using a 33-item index. A final sample of 68 firms is chosen after excluding twenty-two financial, banking, and insurance firms and firms with no data. The results suggest that AC size and meetings are positively correlated with FRQ, which aligns with agency theory predictions. In contrast, the AC financial expertise exhibits a negative relationship with FRQ. Moreover, the influence of ACFE emerges as a hindrance, contradicting resource dependency theory, while AC independence does not significantly impact FRQ. Overall, these results offer new insight into corporate governance and the mitigation of agency issues..

Keywords - Audit Committee Attributes, Financial Reporting Quality, NICE 33-Item Index, Panel Data.

Introduction

Entities efficiency is critical for sustainable economic growth. However, achieving firm efficiency is unattainable if entities engage in cunning behaviour and compromise the integrity and financial reporting quality (FRQ). The aforementioned increased adverse action leads to company failure and will likely diminish the trust of shareholders and investors in financial reporting (FR) (Alruwaili, 2024). FRQ refers to the precision of financial statements in conveying

details about a firm's actions, especially cash flows, to inform decisions regarding equity investments (Achim & Chiş, 2014). Additionally, high-quality financial reports exhibit transparency, clearly showing a company's financial condition and performance, while providing sufficient context for understanding the presented numbers. It is important to recognise that FRQ encompasses a wide range of information, not limited to financial data alone, and non-financial evidence that aids executives (Herath & Albarqi, 2017). Eventually, realising the quality continuum improves interested

parties' ability to consider financial information's reliability and make informed choices, highlighting the importance of attempting high-quality reporting practices in companies. Therefore, FRQ is assessed based on its usefulness in decision-making. FRQ depends on several factors, such as regulatory compliance, auditor independence, internal controls, and corporate governance (CG) practices, which significantly influence where a financial report falls on this spectrum.

National and global regulators issue the CG mechanism to instil investors' trust. At the core of a practical CG framework, the Audit Committee (AC) is vital for ensuring the precision in financial reporting and adherence to regulatory requirements (Sahu & Deb, 2024). AC is integral to effective CG mechanisms, as it enhances FRQ, bolsters auditor effectiveness, promotes independence and impartiality, refines risk management practices, and supports informed financial decision-making (Sahu & Deb, 2024). The supervisory responsibilities of policymakers, regulators, and practitioners underscore the importance of ACs. In the last two decades, many ACs amendments have been made to clarify their power, duties, strength, composition, and responsibilities. Regulators such as the Securities Exchange Board of India (SEBI), the Ministry of Corporate Affairs (MCA), the Institute of Chartered Accountants of India (ICAI), the Company Law Board (CLB), and the National Financial Reporting Authority (NFRA) played a significant role in the evolution of ACs.

Studies indicate that in India, the examination of AC characteristics and their relation to FRQ is skewed. The study conducted by Mishra and Malhotra (2016) is probably the first in India to study the relationship between the effectiveness of

AC attributes and FRQ. They observe a substantial impact of AC characteristics on FRQ (as a proxy for earnings quality). Similarly, Shankaraiah and Amiri (2017) also estimated a positive relationship between AC quality and FRQ, using AC quality characteristics and abnormal accruals as an indicator of FRQ. Hundal (2016) investigated multiple directorships of AC members and FRQ in India and found a significant association between them using the median committee board size, AC level, chair expertise, independent directors for multiple directorships, and real earnings management is assessed using discretionary accruals as an indicator of FRQ. However, the presence of overlapping audit and compensation committees is associated with increased FRQ and cost for overlapping committees (Chandar et al., 2012); discretionary accruals are also employed as an indicator of FRQ. Kaur and Goel (2017) assessed the impact of the change in legal frameworks and found no significant change in legal regulatory frameworks, suggesting that amendments to the Companies Act 2013 have no influence on enhancing the FRQ of Indian companies. This study used the 21-item index to measure FRQ directly. This 21-item index tool was used to curate the data. Similarly, worldwide, these direct measures are popular for measuring FRQ directly; initially, this index tool contained 21 items (Beest et al., 2009), but later evolved into the 33-item index (Kabwe, 2023); this 33-item index considers financial and non-financial information and is likely to be more accurate than other Measures of FRQ. Interestingly, the literature in the Indian context is more focused on using indirect measures or proxies such as discretionary accruals, the absolute value of abnormal accruals, real earnings management, total accruals, earnings quality, and index. Nonetheless, this study aims to address how AC characteristics, including AC

meetings (ACM), AC independence (ACI), AC size (ACS) and AC financial expertise (ACFE), influence FRQ using these 33-item tools.

This study makes a significant contribution to the ongoing academic debate in several ways. First, it bridges the gap in the existing literature by exploring the correlation between AC attributes and FRQ. Second, a strong positive association between ACs and FRQ has been documented. Third, it highlights the importance of AC characteristics and FRQ. Fourth, it presents novel insights focusing on the 33-item Index for FRQ within the framework of developing economies like India. Finally, it provides robust findings proxying the direct measures (NICE 33-Item Index) of the FRQ.

This study has inspired an exploration of AC attributes and FRQ in the Indian business context.

The remainder of the study is structured as follows: The second section delineates the theoretical background and articulates the study hypothesis; the third section depicts the methodological approach; the fourth section presents the results and discussion; and the study concludes with its final thoughts.

2. Literature Survey and Hypotheses

2.1. Theoretical underpinnings

The CG mechanism plays a crucial role in increasing the likelihood that companies will report a higher FRQ. Prior studies have investigated the influence of AC characteristics on FRQ. In addition, scholars around the world have relied on agency theory (AT) (Chronopoulos et al., 2024; Kantudu & Alhassan, 2022; Sharawi, 2022; Ali, 2021; Hasan et al., 2020; Moses, 2019), resource dependency theory (RDT) (Kantudu & Alhassan, 2022; Ali,

2021; Hasan et al., 2020), stakeholder theory (Ali, 2021; Al-Absyet al., 2019; Moses, 2019), and signalling theory (Ali, 2021) to see the behaviour of different theories in the connection between AC characteristics and FRQ. This research used AT and RDT theories to establish the linkage between theories and research variables (as described in Section 3).

2.1.1. Agency Theory

Agency problems persist within organisations due to the delegation of responsibilities by shareholders, who are the owners, to managers or directors, known as agents. These agents are anticipated to act in the best interests of the owners, who are referred to as principals (Jensen & Meckling, 1976). By contrast, managers work in their own interests, which raises concerns for the principal and creates an agency problem. Interestingly, it highlights the importance of CG mechanisms in aligning their interests (Eisenhardt 1989). Agency costs arise when there is a divergence between the interests of agents and principals, and independent boards comprising committees such as AC, risk management, corporate responsibility, shareholder relationships, and nomination and remuneration are integral to monitoring and constraining managerial actions (Jensen & Meckling, 1976). In this theory, the establishment of an AC is advocated as a strategy to alleviate the agency problem by enhancing the transparency and credibility of audited annual reports, particularly in situations characterised by a high proportion of external shareholders and dispersed ownership. Nonetheless, although designed to safeguard principal interests and promote effective governance, empirical evidence indicates that voluntary formation of ACs tends to be less effective because of the absence of external

mandates, thereby implying that legislative-mandated ACs are more successful in reducing agency problems and improving FRQ (see Wu et al., 2012; Fama & Jensen, 1983; Alchain & Demsetz, 1972).

2.1.2. Resource Dependency Theory

The RDT posits that boards are critical in providing essential human and relational capital resources. Human capital includes committee size, member expertise, and reputation. In addition, relationship capital encompasses the network connection established with other firms and external contingencies. Furthermore, the theory posits that a firm's board supplies all the necessary resources for its committees to make sound decisions and effectively oversee functions, irrespective of the incentives offered. These resources are conceptualised broadly to include any element that can reinforce a firm's strength or mitigate its weakness (Wernerfelt, 1984). According to Pfeffer and Salancik (1978), board members are expected to support the organisation by addressing its issues, representing it externally, and providing various forms of assistance. They identified four advantages of board involvement: provision of advice and control, conferment of legitimacy, establishment of communication channels with all stakeholders, and preferential access to external commitments (Pfeffer & Salancik, 1978).

Moreover, the RDT argues that a large board yields superior corporate outcomes because it incorporates diverse skills, knowledge, and expertise that enrich board discussion. The principle extends to ACs, where a significant number of members can contribute valuable experience and skill, thereby enhancing the committee's ability to oversee the organisation, improve earnings quality,

and strengthen FR. Consequently, smaller audit committees that lack such diversity are typically less effective in fulfilling these roles (Fariha et al., 2022; Mardessi, 2021).

Again, RDTs' frequent AC meetings boost internal monitoring and improve FR transparency by capitalising on directors' expertise. However, when ownership is highly concentrated, the independence of directors may be compromised, rendering AC meetings less effective. The financial expertise within the AC helps reduce restatements and misreporting and improves reporting quality. Moreover, the autonomy granted to the AC facilitates unbiased decision-making, efficient identification, and correction of errors. Overall, RDT posits that the AC, endowed with diverse resources, expertise, and experience- including directors with varied relevant skills reflecting the organisation's external social context-provides a firm competitive advantage in FRQ.

2.2 Audit Committee and FRQ

The AC serves as a vital accountability tool and CG mechanism and is pivotal in monitoring, overseeing, appointing, compensating, supervising external auditors, and reviewing financial statements (Sahu & Deb, 2024). Literature on the impact of AC characteristics and FRQ has gained significant interest among scholars in developed and emerging economies. A composite tool or index to analyse FRQ has been developed (Kabwe, 2023; Beest et al., 2009). First, this Index was constructed by utilising the Exposure draft of the IASB, which contains a 21-item index (Beest et al., 2009). Furthermore, the 21-item index was transformed into a self-administrated questionnaire of the 33-item index to gauge the FRQ scores (Mbawuni, 2019). Later, Mbawuni's (2019) work

was transformed into a 33-item composite tool by NiCE to judge firms' FRQ (Kabwe, 2023). They analysed the trustworthiness and authenticity of the constructed composite NiCE tool, and the outcome was significant, reliable, and valid.

2.2.1. Audit Committee Size and FRQ

To some extent, AC effectiveness is dependent on attributes such as AC size (Mohammad et al., 2017). As per the Kumar Mangal Committee, the AC should have at least three members, none of whom be interested in the firm's management. Again, a more prominent AC member is likely to regulate the FR procedure, reducing financial restatements and any irregularities in financial statements (Lin et al., 2015). However, a reduced AC size will likely reduce committee efficiency. A study in Indonesia that investigates AC attributes on voluntary disclosure reveals that ACS is positively associated with FR (Setiany et al., 2017). Further, Mohammad et al. (2017) explore the association relating ACS and accounting conservatism using a sample of 206 businesses from 2004 to 2007. The findings indicate that ACS is positively associated with accounting conservatism. ACS increases FRQ because of the vast skills and expertise they have gathered while working with different firms (Setiany et al., 2017). Previous studies have also documented that ACS is negatively related to FRQ (Agyei-Mensah & Yeboah, 2019; Juhmani, 2017; Umobong & Ibanichuka, 2017; Salihi & Jibril, 2015). Conversely, other scholars have also revealed that the ACS results suggest an insignificant relationship with FRQ (Alruwaili, 2024; Hasan et al., 2020; Bamahros & Bhasin, 2016). From this argument, one can derive the following hypothesis:

H1: ACS and FRQ are strongly positively correlated.

2.2.2. Audit Committee Independence and FRQ

AC's efficacy can be assessed in terms of its members' independence and the composition of non-executive managers, who treat independence as a significant element of interest. In this study and according to the literature, ACI is articulated as the proportion of Independent directors relative to the total number of associates in AC (Kapoor & Goel, 2017; Nekhili et al., 2016; De Vlaminc & Sarens, 2015; Lin et al., 2015). Several studies have shown that AC members who are chaired with independence are likely to have a positive association with higher FRQ and reduced counterfeit activities (Kapoor & Goel, 2017; Nekhili et al., 2016; De Vlaminc and Sarens, 2015; Lin et al., 2015). Similarly, Komal et al. (2023) exhibit that ACI is a significant determinant of AC efficiency, limiting abnormal accruals and increasing monitoring responsibility. The same outcome has been recorded in an Indonesian study exploring the association between board attributes and earnings quality (Setiany, 2017). Interestingly, the results of Hasan et al. (2020) indicate an adverse connection concerning ACI and FRQ. From the disagreement, it is noted that the literature reports mixed findings, that is, positive, negative, insignificant, and not significant; however, a large number of literature outcomes are positive. Thus, our research hypothesis can be formulated as:

H2: ACI and FRQ are strongly positively correlated.

2.2.3. Audit Committee Meeting and FRQ

The literature of Hasan et al. (2020) states that AC members are entrusted to make available them for any fruitful discussion and meeting with the view of enhancing the FRQ of the firm and

looking after the internal control. AC members who meet frequently aid in regulating the FR process and performing subsequent tasks (Greco, 2011). According to the Companies Act, 2013, an AC is required to convene at least four times annually, ensuring that no more than 120 days elapse between any two successive meetings. Most early studies are consistent, i.e., a positive association of ACM and FRQ has been captured (Shankaraiah & Amiri, 2017). Similarly, more frequent meetings among AC members result in decreased discretionary accruals and improved FRQ (Habbash & Alagla, 2015). In contrast, the study by Shahkaraiah and Amiri (2017) regarding AC attribute and FRQ in India appears a notable negative correlation between ACM and FRQ. Likewise, other researchers have also assimilated that ACM has an insignificant influence on FRQ (Bamahros & Bhasin, 2016; Habbash & Alagla, 2015). They also stated that if the FRQ is inactive or lacks vigilance, increasing the frequency of meetings would lead to stagnation (Abbott, 2016). From the above argument, it is noted that the literature reports mixed findings, that is, positive, negative, insignificant, and not significant; however, a large number of literature outcomes are positive. Thus, our research hypothesis can be formulated as:

H3: ACM and FRQ are strongly and positively correlated.

2.2.4 Audit Committee's Financial Expertise and FRQ

RDT postulates that AC associates should be equipped with different resources, such as financial expertise and firm experience, in the most affordable manner to leverage FRQ (Hasan et al., 2020). ACFE are necessary for firms as their presence in AC members elaborates accounting nos. and oversees

the FR process, which will likely improve the FRQ. The AC's main task is to read and understand FRs and be involved in auditing processes. Therefore, it is important to claim that the presence of ACFE in the Committee aids in AC effectiveness because a range of duties involves members being equipped with a high level of accounting vis-à-vis financial knowledge. According to Mardessi and Fourati (2020), ACFE is an important factor that decreases earnings management and increases FRQ. They deliberate that AC members with financial proficiency are seen as strengths. According to a US study, suggests that having too many members with such expertise in the AC can reduce the FRQ (Carrera et al., 2017). Nonetheless, researchers contend that AC members possessing expertise in accounting and auditing are anticipated to diminish the capacity of managers to manipulate earnings, thereby enhancing the trustworthiness of financial statements. The study by Ali (2021) on the GCC Stock Market reveals that ACFE gain a significant positive relationship with FRQ. They articulated that AC members must have at least one member with financial knowledge. Previous studies have demonstrated a direct correlation between ACFE and FRQ (Hasan et al., 2020). In contrast, few studies have opposed the empirical results, as the ACFE has an insignificant relationship with FRQ (Katmon & Farooque, 2017; Rainsbury et al., 2009). Furthermore, ACFE is negatively associated with the FRQ (Carrera et al., 2017). From the above argument, it is noted that the literature reports mixed findings, that is, positive, negative, insignificant, and not significant; however, a large number of literature outcomes are positive. Thus, the study has formulated the research hypothesis :

H4: ACFE and FRQ are strongly and positively correlated.

The following table asserts the linkage between Theories, Literature Review and variables

Theory	Assumptions	Variables	Estimates
Agency Theory	The regulators estimate the need for an independent Committee to mitigate the Agency's problems.	AC	The committee is likely to reduce Agency problems and Improve the FRQ
RDT	The Board members allocate required resources to the committee to facilitate the efficient execution of the tasks.	ACS, ACI, ACM, and ACFE	ACS bring human capital. ACI are independent members of the ACS. ACM is the number of times they meet for their obligations. ACFE is the members having accounting knowledge.

*Compiled by the authors

	Association	Significant Positive	Significant Negative	Insignifi- cant	No-impact	Gap	Research estimates
Literature Review	ACS and FRQ H1	Mishra & Malhotra, 2016; Shankaraiah & Amiri 2017; Hundal, 2016	-	-	-	Significant Negative, Insignificant, No-impact	significant positive
	ACI and FRQ H2	Shankaraiah & Amiri 2017; Hundal, 2016	-	-	Mishra & Malhotra, 2016	Significant Negative, Insignificant	significant positive
	ACM and FRQ H3	Mishra & Malhotra, 2016; Shankaraiah & Amiri 2017; undal, 2016	-	-	-	Significant Negative, Insignificant, No-impact	significant positive
	ACFE and FRQ H4	Shankaraiah & Amiri 2017; Hundal 2016	Mishra & Malhotra, 2016	-	-	Insignificant, No-impact	significant positive

*Compiled by the authors

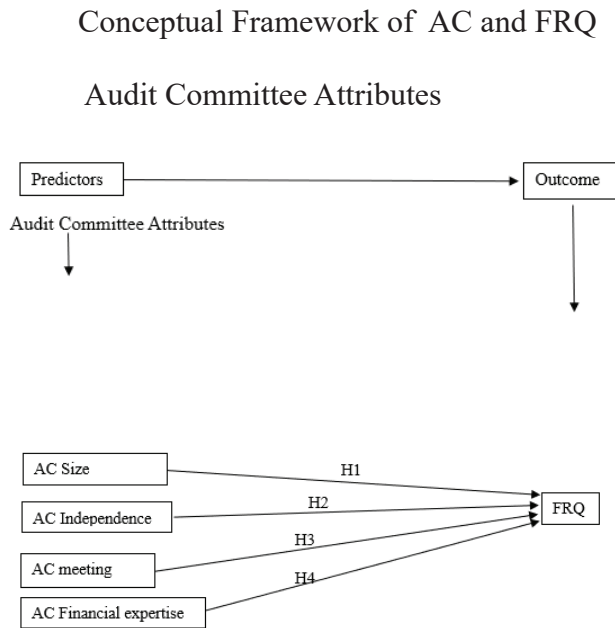


Figure 1. Conceptual model of AC attributes and FRQ study.

Source: The authors.

A conceptual model has been created, as shown in Figure 1, to carry out the research. In the model, the AC attributes like ACS (predictors) are likely to affect the H1 of the FRQ (outcome). Similarly, the ACI (predictors) is also likely to influence the H2 FRQ (outcome). In addition, the ACM (predictors) exhibited that it will influence the H3 FRQ (outcome). Last, the H4 ACFE is likely to affect the FRQ (outcome).

3. Methodology

This section explains how the research methodology pertains to the research problem. In subsequent segments, it demonstrates the research designs, the research methods applied, the choice of variables, and statistical tools used in line with the analysis intents.

3.1 Research Design

It follows an expo-facto research design, i.e., having cross-sectional and time series data characteristics.

3.2 Method

The research utilises a panel data regression procedure to analyse the dataset. This econometric approach effectively mitigates heteroskedasticity and autocorrelation concerns by integrating both individual-specific and temporal effects. This method rigorously enhances the robustness of coefficient estimation and strengthens the validity of statistical inference, particularly when confronted with data exhibiting heteroskedasticity and autocorrelation attributes.

3.2.1 Sample

The study prefers the Bombay Stock Exchange (BSE) listed BSE-100 indexed companies covering the period 2016-2023. The BSE-100 indices are the major stock market contributors, covering approximately 70% of the overall market capitalisation; tracking the performance of 100 large and established companies listed here. The samples were taken on the 20th of December 2024 for selection. The Purposive sampling technique is employed to choose a sample from the population. The total population comprises firms listed in the BSE 100 index from 2016 to 2023. The BSE 100 index comprises the leading 100 companies ranked by market capitalisation. In particular, only 68 companies were considered for further analysis. It uses a selection process to determine which companies will be included in the final group for analysis. Here are the Criteria for including companies:

Inclusion Criteria:

- Companies must be part of the BSE 100 index.
- Companies that do not have their annual reports published are not to be considered.
- Companies must have data for all the components spanning the year 2016 to 2023.

Only companies that meet the above requirements will be considered for the study.

Exclusion Criteria:

- Financial and insurance companies are not included.
- Firms with missing data in any financial year.

If a company is in the financial or insurance sector, it will not be part.

3.2.2 Data collection

Data is gathered from a secondary source. AC characteristics are curated from the Concerned companies' Annual reports, FRQ scores are collected from the annual report using the 33-item Index described in Kabwe, (2023) (See Appendix A), and FS, MC and leverage variables using the Prowess IQ Database.

3.2.3 Study Variables

Following the literature, the study variables have been identified, considering the research agenda, and categorised into dependent, independent, and control variables. It analyses the association of AC traits on FRQ. The qualitative characteristics of FR are used to ascertain the firm's FRQ (direct measurement tool developed by NICE), thus accounting for both financial and non-financial information provided in annual reports. Interestingly,

it aligns with the AT, which indicates that outside directors are better at enhancing the monitoring and decision-making role, reducing agency problems, and enhancing FRQ (Jensen & Meckling, 1976). Again, AT infers that a subcommittee (here, AC) is free from management influence and is likely to mitigate the conflict between the agent and principal, making it prominent in eradicating self-interest on the agent's part and working for the interest of the larger good. Meanwhile, RDT postulates that independent committees are more likely to bring diverse knowledge, experience, and oversight skills (Pfeffer & Salancik, 1978). ACs attributes include ACS, ACI, ACM, and ACFE, which act as resources for the companies provided by the boards. The study used the leverage for Risk to complete the regression model.

Variables			Measurement	Authors
Name	Model	Types		
Financial Reporting Quality	FRQ	Dependent	Nice qualitative attribute Model	Kabwe, 2023
AC size	ACS	Independent	The total members in AC	Mardessi, 2021
AC independence	ACI	Independent	The ratio of independent AC members.	Mardessi, 2021
AC meetings	ACM	Independent	AC meetings held in 1 year	Mardessi, 2021
AC Financial Expertise	ACFE	Independent	AC members with financial background.	Mardessi, 2021
Leverage	LEV	Control	The proportion of debt to equity	Hasan <i>et al.</i> , 2020

*Compiled by the authors

3.2.4 Model

Econometric estimation

The research has outlined a model to assess the influence of AC attributes on FRQ.

$$FRQ_{it} = \beta_0 + \beta_1 ACS_{it} + \beta_2 ACI_{it} + \beta_3 ACM_{it} + \beta_4 ACFE_{it} + \beta_5 LEV_{it} + \epsilon_{it}$$

Whereas FRQ_{it} is a continuous variable that represents the direct measure of dependent variables to FRQ based on 33 item index as described in Appendix A ,i.e., ACS_{it} is the total no of AC associates in that Committee; ACI_{it} is the no of independent associates in the AC; ACM_{it} is the total number of AC meeting held in a year; $ACFE_{it}$ number of members are financial experts in the Committee; LEV_{it} is the Risk of the firms, I is numbers of firms; t is the study period, and ϵ_{it} is the random error term.

3.4 Inference Statistics

According to Chairunnisa and Fauzan (2023), highlight that panel data regression is employed because it effectively merges time series and cross-sectional data. This approach is a powerful tool for delivering detailed data, increasing diversity, offering more freedom, and boosting efficiency. Moreover, panel data regression allows for the detection of effects that are not visible when using only cross-sectional or time series data, and it aids in examining intricate data structures within the model. The process starts with pooled ordinary least squares regression. Then, a variance inflation factor (VIF) test checks for multicollinearity, which means seeing if the variables are too similar. The research also uses the Hausman test to choose between fixed and random effects in panel data. The analysis then utilises the Modified Wald

test and Wooldridge tests to assess heteroskedasticity and autocorrelation characteristics in the panel data, respectively.

3.5 Significance Level

The study assumes the significance levels (α) at 10%, 5%, and 1%.

3.6 Research Validity

The study uses a 33-item index tool for assessing the FRQ, which has an ascribed of annual reports as specified in General accepted accounting principles (Kabwe, 2023; Mbawuni, 2019). This tool has five attributes of financial reports: Relevance includes 13 items, faithful representation includes seven items, understanding has six items, comparability has six items, and timeliness has one item (see Appendix A). similarly, scholars may use this index tool to replicate the research. Additionally, researchers can use the exact data for analysis of all the variables, such as FRQ measured using a 33-item index (dependent variables), ACS, ACI, ACM, and ACFE (independent variables), considering each variable accessed using the firms' annual report and LEV (control variable) extracting from CMIE Prowess database, using time period as stated in the study may result in similar findings.

4. Results and Discussion

This research utilises panel data regression models to explore the connections among AC attributes and FRQ. The fixed effect method's regression models are executed using STATA 17 to test the hypotheses.

4.1 Descriptive Statistics

Table 4: Descriptive Statistics*					
Variables	Obs.	Min	Max	Mean	Std. dev.
FRQ	441	2.52	3.42	3.092	.1940
ACS	441	3	8	4.319	1.105
ACI	441	.5	1	.869	.1408
ACM	441	0	14	5.916	1.962
ACFE	441	1	8	4.199	1.140
LEV	441	-7.12	421.09	2.273	21.636

*Source: Authors' Calculation

Table 4 depicts the descriptive statistics of the variables. FRQ substantial variation among sample firms in making significant improvements in the accurate financial figures, with values ranging from minimum and maximum 2.52 to 3.42, respectively. The average values of ACS have indicated that the firms are considering four members in their ACS and have reported a standard deviation of 1 member in all firms, varying from the mean. ACI has shown a mean value of .869 for the independent members.

ACI has a minimum of .50, i.e., and a maximum of 1 member, so half of the members in AC are independent. Moreover, ACM has an average of 5.916 meetings in a year. The legal requirement of ACM is a minimum of zero and an extreme of fourteen meetings in a year. Companies Act 2013 asserts that an AC should meet at least four occasions in a year. Moreover, the ACFE is at a minimum of 1 and 8 in extremes. The average ACFE is 4.199, i.e., at least four members in large ACs have financial expertise, and in small ACs, all members can read and understand the annual report. LEV shows a risk factor with a ratio of 2.273, a firm with low LEV indicated as -7.12 affirms no risk for some institutions, and some have a risk ratio of 421.09.

4.2 Statistical inference

4.2.1 Correlation Investigation

Table 5 illustrates the relationship between the variables FRQ, ACS, ACI, ACM, ACFE, and LEV through correlation analysis. First, FRQ is positively associated with the ACM (0.2400***) and LEV (0.0544) at 1% and 10% significance levels, respectively, suggesting an increased frequency of ACM and higher LEV likely to be associated with the improved FRQ. Contrary to that, FRQ is negatively associated with the ACS (-0.0056), ACI (-0.0612) and ACFE (-0.0896*), indicating that a larger ACS, greater independence and financial knowledge may not positively be associated with FRQ in this context. Furthermore, the ACS reveals a strong positive correlation between the ACFE 0.9158*** at 1% significance levels, advocating that a larger ACS often have more members with financial expertise. Alternatively, ACS shows a negative correlation with the ACI (-0.7808***), which implies that as ACS increases, independence is likely to diminish. ACS weakly correlates with

ACM (-0.0376) and LEV (-0.0497), indicating a minimal relationship between the variables. ACI indicates a significant negative connection between the ACS (-0.7808***) and ACFE (-0.7818***), suggesting a greater autonomy ACS coincided with fewer members and having financial knowledge. ACI has a mild negative association with ACM (-0.1194**) and a very weak correlation with LEV (-0.0506). ACM shows an optimistic Association with the FRQ (0.2400***) and ACFE (0.1286***) at a 1% significance level, exhibiting that an increase in no of meetings may enhance the FRQ and with more no members having financial knowledge are likely to meet more frequently. Furthermore, ACM shows a weaker correlation with ACS (-0.0376) and ACI (-0.1194**), indicating a less significant relation. ACFE is strongly and positively associated with ACS (0.9158***), and it has a positive correlation with ACM (0.1286***). However, ACFE is negatively correlated with ACI (-0.7818***) and FRQ (-0.0896*) at 1% and 10%, respectively. LEV exhibits a weaker correlation across the variables, including positive correlations with FRQ (0.0544) and ACM (0.0769), and a negative association with ACS, ACI, and ACFE; this relation indicates that LEV is relatively not dependent on other variables. Interestingly, the results of the correlation matrix reveal an intriguing interaction among AC characteristics and FRQ, highlighting the importance of ACM and indicating conclusive impacts of other AC attributes. Additionally, from the above outcome, it is evident that to check whether the multicollinearity issue persists or not and to test the multicollinearity issue, this study has used variance inflation indicators (VIF). The outcomes are displayed in Table 6.

	FRQ	ACS	ACI	ACM	ACFE	LEV
FRQ	1.0000					
ACS	-0.0056	1.0000				
ACI	-0.0612	-0.7808***	1.0000			
ACM	0.2400***	-0.0376	-0.1194**	1.0000		
ACFE	-0.0896*	0.9158***	-0.7818***	0.1286***	1.0000	
LEV	0.0544	-0.0497	-0.0506	0.0769	-0.0333	1.0000

*Source: Authors' Calculation

Note: ***< 1%, **<5% and *<10%.

4.2.2 Collinearity assessment

Variables	VIF	1/VIF
ACS	7.00	0.142
ACI	2.78	0.359
ACM	1.08	0.930
ACFE	6.99	0.143
Leverge	1.01	0.988
Mean VIF	3.77	

*Source: Authors' Calculation

The model has been evaluated for multicollinearity using the Variance Inflation Factor (VIF). Table 4 displays VIF values that fall below the recommended threshold. According to Gujarati and Porter (2008), a VIF value under 10 indicates the absence of multicollinearity issues. Furthermore, Bowerman and O'Connell (1990) suggest that a mean VIF value below 1 may indicate potential bias in the regression model. The VIF analysis data are displayed in Table 6, with a mean VIF score of 3.77. Additionally, the test confirms that the variables' VIF values are within the specified limit as per Gujarati and Porter (2008). The maximum VIF values are 7.00 (ACS) and 6.99 (ACFE). Based on the VIF outcomes, it can be inferred that the study is not affected by multicollinearity.

Variables	Labels	Heteroscedasticity Test		Autocorrelation Test	
		Modified Wald test	Probability	Wooldridge test	Probability
Dependent	FRQ	4.6e+06	0.000***	455.665 (F-stat.)	0.000***

*Source: Authors' Calculation

Note: ***< 1%, **<5% and *<10%.

Table 7 showcases the findings of the variable diagnostic tests, including the Heteroscedasticity test and the Autocorrelation test, for FRQ. The Modified Wald test yielded a p-value of less than 0.05, indicating the presence of heteroscedasticity within the model. Additionally, the Wooldridge test reported a p-value below 0.05, further indicating the presence of autocorrelation in the FRQ model.

Models	Chi2 Value	Value	Fixed Effects or else Random Effects
FRQ	863.38	0.000***	Fixed

Table 8 displays the findings of the Hausman Test, which was performed to identify the optimal method between the Fixed effect model and the Random effect model for analysing panel data. The test results favour the fixed effects in the FRQ model, as indicated by a p-value below 0.0

	OLS	Fixed Effect	Random Effect	PCSE
Variables	FRQ	FRQ	FRQ	FRQ
ACS	0.3793	0.0429	0.0686	0.3793
	0.000	0.480	0.257	0.002***
ACI	-0.0084	-0.0043	-0.0048	-0.0084
	0.565	0.713	0.670	0.428
ACM	0.0187	0.0050	0.0072	0.0187
	0.000***	0.199	0.056***	0.001***
ACFE	-0.0786	-0.0028	-0.0092	-0.0786
	0.000***	0.824	0.471	0.007***
LEV	0.0004	-0.0001	-0.0001	0.0004
	0.320	0.482	0.568	0.209
Constant	2.7991	3.0298	3.0088	2.7991
	0.000***	0.000***	0.000***	0.000***
Observations	441	441	441	441
R-squared	0.0947	0.2438	0.0071	0.0947

*Source: Authors' Calculation

Note: ***< 1%, **<5% and *<10%.

Table 9 displays the findings from the Panel data regression analysis, which are derived from the estimates shown in Table 8. Again, the Hausman results preferred fixed effects models and applied the panels corrected standard errors (PCSEs) method to mitigate the issue of coefficient estimation error, which

persists due to autocorrelation, contemporaneous correlation and heteroscedasticity in the panel data. The estimated econometrics model shows a positive significant result and is statistically substantial between AC and FRQ. It exhibits that a firm with effective AC characteristics will likely reduce restatement, irregularity, and misrepresentation of annual reports and may improve the FRQ. The regression result aligns with the literature (see Chronopoulos et al., 2024; Kabwe, 2023; Sharawi, 2022; Ali, 2021; Olowooker et al., 2021; Hasan et al., 2020; Moses, 2019). Nonetheless, the outcome of the research also contests (e.g., Miko & Kamardin, 2015; Bajra & Čadež, 2018).

Based on Table 9, there is a noteworthy significant correlation between ACS FRQ, with a p-value of less than 0.01%. This result shows that a higher number of ACs enhances the FRQ; a more significant number provides a considerable source of manpower to AC and aids the Committee in carrying out responsibilities effectively, as more significant AC members possess various skills and industry experiences. This result is also associated with the CG regulations and Securities Exchange Board of India (SEBI) norms of India. The result rejects the null hypothesis, “There is no significant positive association between ACS and FRQ”, and accepts the alternative hypothesis “, There is a significant positive association between ACS and FRQ”. Furthermore, the outcome is evident that there is a positive relationship. The study is consistent with the literature (see Ali, 2021; Hamdan, 2020; Setiany et al., 2017; Shankaraiah et al., 2017; Kamolsakulchai, 2015). Alternatively, it also deviates from others (e.g., Agyei-Mensah & Yeboah, 2019; Juhmani, 2017; Mohammad & Ahmed, 2017; Umobong & Ibanichuka, 2017; Salihi & Jibril, 2015; Soliman & Ragab, 2014;

Habbash et al., 2013) which reveal an insignificant relation between ACS and FRQ. Furthermore, the inconsistent results in studies indicated various reasons, such as different measures (direct and indirect) used for FRQ, sample size, varied regulatory requirements and country-specific studies.

The regression result of H2 exhibits that there is no significant relation between ACI and FRQ. Table 9 ACI has a p-value of 0.428, which is higher than 0.05%. The finding proposes that ACs may be unable to assure the FRQ due to members’ lack of independence or financial expertise. The findings support the null hypothesis, stating that “There is no significant positive association between ACI and FRQ”, while dismissing the alternative hypothesis “, There is a significant positive association between ACI and FRQ”. The results are in line with the studies (see Alruwaili, 2024; Kabwe et al., 2021; Hasan et al., 2020; Boolaky, 2019; Tawiah & Paulinus et al., 2017; Bamahros & Bhasin, 2016; Bryce et al., 2014; Cohen, 2014; Bedard et al., 2004; Abdulrahman & Ali, 2006). The study reflects that more independent members in ACs are not associated with power and authority due to contradiction of interest among the members and the urgency to oversight likely to reduce the FRQ. However, a few studies by Kapoor and Goel, 2017; Nekhili et al., 2016; De Vlaminck and Sarens, 2015; and Lin et al., 2015, have indicated a significant positive connection between ACI and FRQ. According to Umobong and Ibanichuka (2017), ACI is linked to an increase in voluntary disclosure and has been found to have a significant positive correlation with enhanced FRQ.

Additionally, Table 9 indicates a significant positive correlation between ACM and FRQ. The

findings indicate a probable dismissal of the null hypothesis, which states, “There is no significant positive association between ACM and FRQ,” and instead support the acceptance of the alternative hypothesis.”, There is a significant positive association between ACM and FRQ”. The regression analysis indicates a p-value of 0.001, which is lower than 0.05, demonstrating a favourable significance at the 1% level. This finding is supported by existing literature (Shankaraiah & Amiri, 2017; Habbash & Alagla, 2015; Hamdan, 2020; Mwangi, 2018; Hasan et al., 2020). Interestingly, it added to the mandatory requirement of the Indian Companies Act 2013, elaborates on meeting ACs frequently, and works actively to reduce any asymmetry in the annual report, thereby enhancing FRQ. Again, the outcome of this study is contest with prior pieces of literature such as Bamahros & Bhasin, 2016, Yang and Krishnan, 2005 occur due to the pre-adoption of the IFRS period of investigation, which implies a deficiency in the Act or just for the sake of the requirement before that a defined role and frequency of meetings. According to Abbott (2016), the frequent meeting of AC members limits the FRQ because of the lack of active action from the members or because of being in a meeting for some economic benefits and no productive meetings.

The correlation between ACFE and FRQ results in a p-value of 0.007, which is less than 0.05, implying a positive significance at the 1% level. In Table 9, the outcome supports the likelihood of rejecting the null hypothesis, which states, “There is no significant positive association between ACFE and FRQ”, and accepts the alternative “, There is a significant positive association between ACFE and FRQ”. The accountability ACs are responsible for reviewing and comprehending FRs by overseeing internal control and monitoring the audit. Research

conducted by Ali, 2021; Hamdan, 2020; Hasan et al., 2020; Hasan et al., 2019; Mohammad et al., 2017; Januarti, 2017; Chariri & Hayes, 2014; and Umobong & Ibanichuka, 2017 lends support to these studies. In contrast, few studies have opposed the empirical results as ACFE has an insignificant relation to FRQ (Carrera et al., 2017; Katmon & Farooque, 2017; Bamahros & Bhasin, 2016; Rainsbury et al., 2009; Yang & Krishnan, 2005). Furthermore, the outcome suggests that ACs equipped with members have a vast knowledge of accounts and finances that directly benefit FRQ. Further, the members’ ability to understand and read the FRs is likely to hinder the managers in earning management.

Interestingly, the multiple regression results of LEV and FRQ suggested that they were insignificant, with a p-value of $0.209 > 0.05$, indicating insignificance. The debt-to-assets ratio measures LEV, and the result indicates that there is an insignificant association consistent with the works of literature (Soliman & Ragab, 2014; Habbash et al., 2013).

5. Conclusion

The study captures evidence of AC attributes and FRQ in the Indian business environment. The data were gathered by accessing the respective firm’s websites for annual reports and using a 33-item index to calculate the FRQ score for the 100 listed BSE companies. The outcome states that three out of the four hypotheses led to the repudiation of the null hypothesis in favour of the alternative. Furthermore, one of the postulations has accepted the null and rejected the alternative hypotheses. It documents that AC attributes would likely improve the FRQ with their monitoring and supervising internal control skills and the quality of reported

financial results. Moreover, this study's findings align with the assumption made in the AT and RDT forecasts. ACS asserts a significant positive association, indicating that the size of the ACs is influential as it brings a considerable workforce to the firm, and this human capital is intended to work independently without being influenced by the principal. In addition, ACS comprises varied members who bring different knowledge, skills, years of experience, and a vast network from other industries.

Furthermore, ACM has a frequency of AC members discussing issues related to annual reports, audit quality, the appointment of an auditor, and other issues related to ACs. ACs that meet regularly are considered to reduce the irregularities in the FR, thereby enhancing the FRQ. Again, as RDT confirms different resources provided by the directors. However, the ACFE has a negative significant relation with FRQ, which contradicts the postulation of AT that the financial expertise of the AC members hinders rather than being communicative towards the principal as they are unable to understand the facts disclosed and misunderstand the agent is likely to work for their interests. This ACFE outcome is contrary to the RDT as this resource is not likely to improve the FRQ and, instead, is just a mere counter-checking of FRs. This behaviour leads to a waste of resources. ACI neither aligns nor contradicts any of the theories. ACI has an insignificant association with FRQ; this outcome states that AC members are working influenced by the principal, and this behaviour leads to reduced FRQ.

The study indicates a few practical implications for standard-setters, regulators, and policymakers. The Companies Act of 2013,

particularly under section 177 and in conjunction with the Companies (Meeting of Boards and its Power) Rules, 2014, mandates that each publicly listed business and, in exceptional cases, further specified classes of firms should establish an AC. This requisite is constructed to improve the CG by confirming robust oversight of FR processes, internal control, and risk management. In line with the aforementioned sections of the Companies Act, all companies that are publicly listed must also comply with Regulation 18 of the SEBI Listing Obligation and Disclosure Requirements (LODR) Rules 2015. The Companies Act presents the total number of AC members required, with a minimum of three members; within them, the majority shall be independent directors. The LODR of SEBI reiterated that the criteria mentioned earlier require that two-thirds of the members be independent directors, and at least one associate should possess expertise in financial or a pertinent field of financial management. Accordingly, the lawmakers should oversee whether the above requirements and provisions of the Companies Act are religiously followed. However, in the Indian business scenario, it is noted in the early years of implementation that they are only eager to follow or meet the requirements of the law rather than considering it as a good CG practice. Nowadays, the Annual reports suggest that they are not only following the minimum requirement but also considering it as a means for improving CG practices, which raises questions about the functioning of ACs in India. NFRA, a body constituted by the parliament in 2018 with a motive for the quality control mechanisms to review the Annual reports of suspicious firms, has now become the standard setter by the Indian legislature. NFRA also suggests that the prime responsibility for overseeing the reported results now lies with the ACs, and for any discrepancies,

the AC members will be held liable.

The research acknowledges some limitations. First, using a small sample size may constrain the generalisability of the outcome. It confines itself to specific AC characteristics and excludes gender diversity in AC, the industry experience of AC members, multiple directorships, and the percentage of non-executive directors within AC, which may have significantly different outcomes. It prefers to calculate only a 33-item FRQ score. It considers the AT and RDT. Those theories may not be applicable in different country-specific business environments; other theories, such as stakeholder theory and signalling theory, could likely be used to chalk out relationships among ACs and FRQ. Finally, the research originates in the Indian regulatory framework. The applicability of the finding may be limited to the Indian business environment and may vary in other country-specific regulatory contexts.

Future research may consider a larger sample size and incorporate additional variables, such as gender diversity in AC, members' industry experience, the role of AC quality and the proportion of non-executive members within AC. However, the study can also use the FRQ using a 33-item index and other accounting proxies. The AT and RDT are considered; however, these theories may not be universally applicable across varying country-specific business contexts. Alternative theoretical frameworks, such as Stakeholder theory and Signalling theory, could potentially be employed to establish relationships between ACs and FRQ. Moreover, comparative studies of cross-country investigations could help identify whether the regulatory framework of the different countries has any influence on AC attributes and FRQ. The

research could also investigate the characteristics of AC and FRQ, along with the role of audit quality as a mediator in the context of India.

Conflict of Interest

The Author(s) affirm that no probable conflict of interest has arisen in connection with the investigation, writing and/or publication.

Funding

The Author(s) declare that they have not received any financial support related to the research, writing, or publication of this work.

References

- Abbott, L. J., Brown, V. L., & Higgs, J. L. (2016). The effects of prior manager-auditor affiliation and PCAOB inspection reports on audit committee members' auditor recommendations. *Behavioral Research in Accounting*, 28(1), 1-14.
- Achim, A. M., & Chiş, A. O. (2014). Financial accounting quality and its defining characteristics. *SEA: Practical Application of Science*, 2(3), 93-98.
- Agyei-Mensah, B. K., & Yeboah, M. (2019). Effective audit committee, audit quality and earnings management: Evidence from the Ghana Stock Exchange. *International Journal of Managerial and Financial Accounting*, 11(2), 93–112.
- Al-Absy, M. S. M., Ku Ismail, K. N. I., & Chandren, S. (2019). Audit committee chairman characteristics and earnings management: The influence of family chairman. *Asia-Pacific Journal of Business Administration*, 11(4), 339-370.

- Al-ahdal, W.M., & Hashim, H.A. (2022). Impact of audit committee characteristics and external audit quality on firm performance: evidence from India. *Corporate Governance*, 22(2), 424-445.
- Ali, S. (2021). Audit committee attributes, audit quality, and financial reporting quality: evidence from the GCC stock markets. *Journal of Financial and Commercial Research*, 22(3), 560-594.†
- Alruwaili, T. F. (2024). The influence of audit committee attributes on earnings management: evidence from listed insurance firms. *Journal of Governance and Regulation*, 13(1), 160-171.
- Bajra, U., & Čadež, S. (2018). Audit committees and financial reporting quality: The 8th EU Company Law Directive perspective. *Economic Systems*, 42(1), 151-163.
- Bamahros, H. M., & Bhasin, M. L. (2016). Audit committee characteristics and unexpected accruals: an empirical study of Malaysia. *Wulfenia*, 23, 181-199.
- Beest, F. V., Braam, G. J. M., & Boelens, S. (2009). Quality of Financial Reporting: measuring qualitative characteristics.
- Bowerman, B. L., & O'connell, R. T. (1990). *Linear statistical models: An applied approach*. (No Title).
- Carrera, N., Sohail, T., & Carmona, S. (2017). Audit committees' social capital and financial reporting quality. *Accounting and Business Research*, 47(6), 633-672.
- Chairunnisa, A. D. A., & Fauzan, A. (2023). Implementation of Panel Data Regression in the Analysis of Factors Affecting Poverty Levels in Bengkulu Province in 2017-2020: Implementation of Panel Data Regression. *EKSAKTA: Journal of Sciences and Data Analysis*, 40-45.
- Chandar, N., Chang, H., & Zheng, X. (2012). Does overlapping membership on audit and compensation committees improve a firm's financial reporting quality? *Review of Accounting and Finance*, 11(2), 141-165.
- Chronopoulos, D. K., Rempoutsika, L. M., & Wilson, J. O. (2024). Audit committee oversight and bank financial reporting quality. *Journal of Business Finance & Accounting*, 51(1-2), 657-687.
- De Vlaminck, N., & Sarens, G. (2015). The relationship between audit committee characteristics and financial statement quality: evidence from Belgium. *Journal of Management & Governance*, 19, 145-166.
- Eisenhardt, K. M. (1989). Agency theory: An assessment and review. *Academy of Management Review*, 14(1), 57-74.
- Fama, E. F., & Jensen, M. C. (1983). Agency problems and residual claims. *The journal of law and Economics*, 26(2), 327-349.
- Fariha, R., Hossain, M. M., & Ghosh, R. (2022). Board characteristics, audit committee attributes and firm performance: empirical evidence from emerging economy. *Asian Journal of Accounting Research*, 7(1), 84-96.
- Greco, G. (2011). Determinants of board and audit committee meeting frequency: Evidence from Italian companies. *Managerial Auditing Journal*, 26(3), 208-229.
- Gujarati, D.N. & Porter, D.C. 2008. *Basic Econometrics*. 5th ed. NY: McGraw-Hill.

- Habbash, M., & Alagla, S. (2015). Audit committee effectiveness and audit quality: Evidence from Saudi Arabia. *International Journal of Management Applied Science*, 1(7), 5-14.
- Habbash, M., Sindezingue, C., Salama, A. (2013), The effect of audit committee characteristics on earning management: Evidence from United Kingdom. *International Journal of Disclosure and Governance*, 10(1), 13-38.
- Hamdan, A. M. M. (2020). Audit committee characteristics and earnings conservatism in banking sector: empirical study from GCC. *Afro-Asian Journal of Finance and Accounting*, 10(1), 1-23.
- Hasan, S., Kassim, A. A. M., & Hamid, M. A. A. (2020). The impact of audit quality, audit committee and financial reporting quality: evidence from Malaysia. *International Journal of Economics and Financial Issues*, 10(5), 272.
- Herath, S. K. & Albarqi (2017). Financial Reporting Quality: A Literature Review. *International Journal of Business Management and Commerce*, 2(2), 1-14.
- Hundal, S. (2016). Busyness of audit committee directors and quality of financial information in India”, *International Journal of Business Governance and Ethics*, 11(4), 335–363.
- Juhmani, O. (2017). Audit committee characteristics and earnings management: The case of Bahrain. *International Journal of Accounting and Financial Reporting*, 7(1), 11-31.
- Kabwe, M. (2023). Corporate governance attributes and financial reporting quality: An evidence from a developing country in Africa. *International Journal of Research in Business and Social Science* (2147-4478), 12(1), 179-191.
- Kamolsakulchai, M. (2015). The impact of the audit committee effectiveness and audit quality on financial reporting quality of listed company in stocks exchange of Thailand. *Review of Integrative Business and Economics Research*, 4(2), 328.
- Kantudu, A. S., & Alhassan, I. (2022). Audit committee and financial reporting quality in listed non-financial firms in Nigeria. *Arabian Journal of Business and Management Review (Kuwait Chapter)*, 11(1), 6-14.
- Kapoor, N., & Goel, S. (2017). Board characteristics, firm profitability and earnings management: Evidence from India. *Australian Accounting Review*, 27(2), 180-194.
- Katmon, N., & Farooque, O. A. (2017). Exploring the impact of internal corporate governance on the relation between disclosure quality and earnings management in the UK listed companies. *Journal of Business Ethics*, 142, 345-367.
- Kaur, T., & Goel, A. (2017). Impact of Changes in Regulatory Framework on Financial Reporting Quality: A Study of S&P CNX Nifty Companies. *IUP Journal of Accounting Research & Audit Practices*, XVI(3), 21-33.
- Komal, B., Bilal, Ezeani, E., Shahzad, A., Usman, M., Sun, J. (2023). Age diversity of audit committee financial experts, ownership structure and earnings management: Evidence from China. *International Journal of Finance & Economics*, 28(3), 2664–2682.
- Lin, T., Hutchinson, M., Percy, M. (2015), Earnings management and the role of the audit committee: An investigation of the influence

- of cross-listing and government officials on the audit committee. *Journal of Management and Governance*, 19(1), 197-227.
- Mardessi, S. M. (2021). The effect of audit committee characteristics on financial reporting quality: The moderating role of audit quality in the Netherlands. *Corporate ownership and control*, 18(3), 19-30.
 - Mardessi, S. M., & Fourati, Y. M. (2020). The impact of audit committee on real earnings management: Evidence from Netherlands. *Corporate Governance*, 4(1), 33-46.
 - Mbawuni, J. (2019). Assessing financial reporting quality of listed companies in developing countries: evidence from Ghana. *International Journal of Economics and Finance*, 11(9), 1-29.
 - Meckling, W. H., & Jensen, M. C. (1976). *Theory of the Firm. Managerial Behavior, Agency Costs and Ownership Structure*.
 - Miko, N. U., & Kamardin, H. (2015). Impact of audit committee and audit quality on preventing earnings management in the pre-and post-Nigerian corporate governance code 2011. *Procedia-Social and Behavioral Sciences*, 172, 651-657.
 - Mishra, M., & Malhotra, A. K. (2016). Audit committee characteristics and earnings management: Evidence from India. *International Journal of Accounting and Financial Reporting*, 6(2), 247-273.
 - Mohammad, A. J., & Ahmed, D. M. (2017). The impact of audit committee and external auditor characteristics on financial reporting quality among Malaysian firms. *Research Journal of Finance and Accounting*, 8(13), 9-16.
 - Moses, T. (2019). Board characteristics, audit committee composition, and financial reporting in Nigeria. *International Journal of Innovative Social Sciences & Humanities Research*, 7(1), 37-45.
 - Mwangi, A. K. (2018). Effect of audit committee characteristics on quality of financial reporting among non-commercial State corporations in Kenya (Doctoral dissertation, JKUAT).
 - Nekhili, M., Amar, I. F. B., Chtioui, T., & Lakhal, F. (2016). Free cash flow and earnings management: The moderating role of governance and ownership. *The Journal of Applied Business Research*, 32(1), 255-268.
 - Pfeffer, Jeffrey, and Gerald R. Salancik, 1978. *The External Control of Organizations: A Resource Dependence Perspective*. New York: Harper and Row
 - Rainsbury, E. A., Bradbury, M., & Cahan, S. F. (2009). The impact of audit committee quality on financial reporting quality and audit fees. *Journal of Contemporary Accounting Economics*, 5(1), 20-33.
 - Sahu, R., & Deb, R. (2024). Scientific Mapping of Audit Committee: A Bibliometric Analysis. *Metamorphosis*, 23(2), 103-116.
 - Salihi, A. A., & Jibril, R. U. S. (2015). The effect of board the size and audit committee the size on earnings management in Nigerian consumer industries companies. *International Journal of Innovative Research and Development*, 4(3), 84-91.
 - Setiany, E., Hartoko, S., Suhardjanto, D., & Honggowati, S. (2017). Audit committee char-

- acteristics and voluntary financial disclosure. *Review of Integrative Business and Economics Research*, 6(3), 239-253.
- Shankaraiah, K., & Amiri, S. M. S. (2017). Audit committee quality and financial reporting quality: A study of selected Indian companies. *Jurnal DinamikaA kuntansi dan Bisnis*, 4(1), 1-18.
 - Sharawi, H. H. M. (2022). Effective Audit Committee and Financial Reporting Quality: the Mediating Effect of Audit Quality: Evidence from KSA. *Alexandria Journal of Accounting Research*, 6(2), 47-79.
 - Soliman, M. M., & Ragab, A. A. (2014). Audit committee effectiveness, audit quality and earnings management: an empirical study of the listed companies in Egypt. *Research journal of finance and accounting*, 5(2), 155-166.
 - Umobong, A. A., & Ibanichuka, E. (2017). Audit committee attributes and financial reporting quality of food and beverage firms in Nigeria. *International Journal of Innovative Social Sciences Humanities Research*, 5(2), 1-13.
 - Wernerfelt, B. (1984). A Resource-based View of The Firm. *Strategic Management Journal*, 5, 171-180.
 - Wu, J., Habib, A., & Weil, S. (2012). Audit committee effectiveness: A synthesis of the audit committee literature. *Corporate Board: role, duties and composition*, 8(1), 15-31.
 - Yang, J. S., & Krishnan, J. (2005). Audit committees and quarterly earnings management. *International journal of auditing*, 9(3), 201-219.

Improving the quality of financial reports through professional ethical practices: A comparative study of listed firms in Nigeria and South Africa

Raimi Adekunle, Anisere-Hameed

Department of Accounting, Al_Hikmah University, Ilorin, Nigeria Email: kunleani@yahoo.com.; GSM: 0803 537 8367.

Taiwo Olufemi, Asaolu

Professor, Department of Management and Accounting, Obafemi Awolowo University, Nigeria

Olalekan Oladipo, Akinrinola

Department of Accounting, Finance and Taxation, Caleb University, Imota-Lagos, Nigeria.

Abstract

The need to enhance the confidence of users of financial reports has remain on the front burner of both researchers and the accountancy professional bodies as a whole. This study focused on improving relevance and faithful representation of financial reports through professional ethical practices: A comparative study of listed firms in Nigeria and South Africa. To achieve the objective, this study uses exo facto design. The study covers a period of ten (10) years, from 2014 to 2023. Static panel data regression estimation was performed using Panel Data Regression Model to test the hypotheses. This study revealed that Professional ethics in Nigeria has no significant effect on relevance of financial reports of listed firms, However, professional ethics in South Africa has positive and significant effect on relevance of financial reports of listed firms and professional ethics in Nigeria has less significant effect on faithful representation of financial reports of listed firms, compared with that in South Africa which has positive and significant effect on relevance of financial reports of listed firms. Arisen from the findings of the study, the study recommends that professional bodies in Nigeria should improve on the professional ethics in line with the relevance of financial reports of listed firms so as to align with that of South-Africa. Hence, ethics of relevance is recommended. This will compel the professional accountants/auditors to perform their duties with ethics of relevance. Furthermore, to ensure faithful representation, professional bodies should encourage professional accountants to perform their responsibilities within the ethical code of conduct for professional accountants. Ethics of faithful representation is hereby recommended. This specific ethics is expected to address faithful representation of financial reports.

Keywords - Relevance, Faithful Representation, Financial Reports, Professional Ethics, Financial Report Quality

Introduction

Throughout the financial sphere, the requirement to enhance financial reporting quality in terms of relevance and faithful representation of financial reports through professional ethical practices has been on the front burner (Osunwole, Adeyemi, & Dunsi, 2020), evidenced by the emergence of series of accounting scandals worldwide at the beginning of the twenty-first century, from the largest corporate bankruptcy in the United States-Enron in 2001, produced evidence about a number of financial misstatements. The presentation of doctored financial reports impairs the trust of the public (Owolabi & Omotilewa, 2020). Further examples include WorldCom and Xerox in the United States, Parmalat in Italy and HIH, One Tel, Harris Scarfe in Australia (Dibra, 2016; Ball, 2009). In Nigeria, some of the corporate scandals include Cadbury Nigeria Plc, NAMPAK, Afribank Nigeria Plc (Salaudeen, Ibikunle, & Chima, 2015; Oluwagbuyi & Olowolaju, 2013) and while in South Africa, we have that of Steinhoff, Tongaat Hulett, Gupta-owned companies, VBS Bank, McKinsey & Company, SAP, etc. In their words, Alexander and Britton (2000) opined that these unprofessional practices have created significant doubt on the ability of financial statements to provide financial information about the reporting entity that is useful to existing and potential investors, lenders and other creditors in making economic decisions relating to providing resources to the entity.

The fundamental professional principles: integrity, objectivity, professional competence and due care, confidentiality, and professional behaviour, including the professional working in the interest of the public, are the main factors of most of the criticisms on the job since the

beginning of the twentieth century. This claim is doubted from the regulation makers, law makers, investors, stockholders and other users of financial information (Pourianasab, 2000).

In South Africa, the need to promote professional ethics and financial reporting quality have remained on the front burner as Naidoo (2021) opined that in South Africa, professional ethics and financial reporting quality should form the cornerstone of business and commerce. Professional ethics and financial reporting quality in South Africa is the lifeblood of every institution, be it private or public enterprise. Organisations have to develop and implement a properly structured policy on ethics, outlaying proper governance within the institution. Naidoo (2021) further stated that professional ethics and financial reporting quality are crucial in managing a company's finances and wealth. South African accounting profession must consider transparency, trust and ethics as a crucial area that needs to be present in order to enhance financial reporting quality. The many scandals and ethical dilemmas faced in South Africa, made Naidoo (2021) take stock of what is happening in the industries, in the country and prompted action in law and governance towards ethics and corporate governance. In Nigeria, Bushi (2019) revealed that there has been growing concern in recent times that the recent wave of corporate scandals, which are associated with ethical bankruptcy in the accountancy practice, is eroding the relevance of accounting and financial reporting quality in Nigeria.

Empirically, the existing studies on professional ethics and financial reporting quality provides a new perspective by comparing two countries (Nigeria and South Africa) with the

fundamental attributes of financial reporting quality. However, this study does not consider the enhancing features of financial reporting quality in the relationship.

Unlike in South Africa where fewer reports of unprofessional ethical scandals are reported compared to the numerous accounting scandals and corporate unethical revelations in Nigeria, such as Cadbury Nigeria plc, African Petroleum plc, which has put doubts in the confidence of investors and users of financial reports. This is due to the various manipulations of the content of financial statements, thereby reducing the quality of the accounting information, provided by the management which poses threats to the financial reporting stakeholders. Financial statements information are not only results of the activities of the entity in a particular period; the quality of the reporting process relied mostly on the entity's disclosure of its dealings, choice and application of accounting principles and the professional judgements made. Thus, claim of professionalism in accounting is premise on its commitment to guiding the ethical and professional standards. This is because it involves an assurance that the accounting bodies and their members would not pursue their material self-interests in a way that conflict with their duties to the public. Hence, the provision of relevant and faithful economically representation of reality and actual performance is very important in regaining stakeholders' confidence on the financial reports, in order to assist them in their decision-making.

These failures of corporate entities have been attributed to professionals and managers not following the professional codes of conduct, evidenced not only in the poor quality of financial reporting, but also in the loss of confidence by the

stakeholders who are the end users. These showed that regulations may not be sufficient and that corporate governance needs to be driven by individual ethics and moral values and that Nigeria is not excluded from these scandals, essentially regarding the financial sector involving Societe Generale Bank plc, Oceanic Bank International plc, etc. and non-financial sector such as Cadbury Nigeria plc and African Petroleum plc. This study aims to fill the gap and provides additional insights by exploring the way to improve quality of financial reports through professional ethical practices in Nigeria and South Africa.

In this light, this study's objective is to compare professional ethics with the quality of financial reporting in Nigeria and South Africa. It examines the effect of professional ethics on relevance of financial reports of listed firms. In addition, the study assesses the impact of professional ethics on faithful representation of financial reports of listed firms. In working towards this objectives of the paper, the study offers a critical solution to the need for the provision of useful and qualitative financial information which enables stakeholders to be able to assess business performance, improve trust, confidence and form a basis for a verifiable solution to the unethical practices among the preparers of financial reports.

The study is structured into 6 sections: The "Literature Review and Hypothesis" section which deals with the review of relevant literature. The "Method and Materials" section which discusses the data and methodology of the study. In "Empirical Results and Discussion" section, the study presents the empirical results, interpretation, and discussion of the findings. The "Conclusion, Limitations, and Suggestions for Further Studies" section presents

the conclusion of the paper and the limitations for further studies.

Literature Review and Hypothesis

Professional ethics enhance the quality of financial reporting which provide investors and other financial statement users with clearer and more comprehensive view of an entity's financial performance and position. In this study, quality financial report is a financial statement that enhances financial performance information, simplifying the presentation of complex financial data, and reduce diversity, so as to help investors understand the information and make better comparisons between entities. To do this, this section is divided into various subsection: the discussion of the theoretical underpinning, followed by empirical literature of the study from which the hypotheses are developed. Finally, the study illustrates the interactive effect of professional ethics and the quality of financial reports in both Nigeria and South Africa.

Theoretical Underpinning

The agency theory created by Stephen Ross and Barry Mitnick in the early 60s is one the theories that are used by researchers in explaining the relationship between a connected group of contracts between the owners of economic resources (the principals) and the managers (the agents) who are charged with using and controlling those resources (Jensen & Meckling, 1976). Eyenubo, et al., (2017) opined that "agency relationship occurs when one or more principals engage another person as their agent to do a service at their request".

Agency model suggests that, as a result of information asymmetries and self-interest, principals lack reasons to trust their agents and will

seek to resolve these concerns by putting in place procedures to align the interests of agents with principals and to reduce the scope of information asymmetries and opportunistic behaviour (ICAEW, 2005). Hence, agency theory advanced from an economic view of sharing risk (Eisenhardt, 1989) which occurs between two parties, principals and agents in which the parties possess different ways to resolving the problem (Jensen & Meckling, 1976). Following the decision-usefulness theory developed by Staubus George, J. in his presentation in 1961 and according to International Accounting Standards Board (2008), that the financial reporting object is "to provide information about the financial position, performance and changes in financial position of and enterprise that will be useful to a wide range of users in making economic decisions." It is expected that the information will be comprehensible to those who have a reasonable knowledge of business and economic activities and at the same time are interested in reviewing the information with due diligence (Ram & Tapria, 2019). This view was further buttressed by the Financial Accounting Standards Board (2008) that stated that "the major object of financial reporting is to provide information that is useful to both present and potential investors and creditors and other users in making rational decisions". To measure quality of financial information, a good accounting standard should be a yardstick to determine the decision-usefulness of the information (Jabbar, 2017).

Empirical Literature and Hypotheses

Prior researches on professional ethics and financial reporting quality generally produced positive association. Some of the studies found, in which ethics has positively impacted on the quality

of financial reporting is Iheonkhan and Hassan (2024) that investigated the effect of reporting financial quality and practices accounting ethics: Deposit money banks in Nigeria perspective. The study employed multiple regression analysis method and it was found that banks' unethical accounting procedures have significant impact on the quality of financial reporting. In sub-Saharan African stocks markets, Kwihangana and Tarus (2024) examined the effect of ethical accounting practices on quality financial reports in manufacturing firms in Sulfo Rwanda industries, using SPSS. The study found that ethical accounting practices has positive and significant effect on the quality financial reports in selected manufacturing firms in Rwanda. Lodikero (2023) investigated and identify the significance of ethics in the quality of financial reports and whether ethical accounting practices has any influence on financial reporting quality. This study adopted a qualitative, systematic review methodology. The results showed that ethical principles have a strong influence on the quality of financial statement and provides a new understanding of how important an accountant's ethics are, in producing high quality financial reports. Furthermore, Nkuranga and Tarus (2023) examined the effect of accounting ethics on quality of financial reporting among listed commercial banks in Rwanda stock exchange, using correlation design with a quantitative approach. The study revealed that there is a strong correlation between accounting ethics and the quality of financial reporting,

In Vietnamese, Nguyen (2023) assessed the current status of financial reporting quality for commercial banks through the qualitative characteristics of financial statements. The results showed that the financial reporting quality for enterprises in general and commercial banks in

Vietnam plays a very important role, because it is used by many stakeholders to make relevant decisions. Sahi (2023), measured the influence of qualitative characteristics of accounting information on the quality of financial statements in private commercial banks in Wasit Province, Iraq using SPSS. The study found that there is a very significant influence of accounting information on the quality of financial statements. In the study conducted by Zungenen, et. al. (2023) on the relationship between accounting ethics and the quality of financial reports in the Nigerian brewery industry. Descriptive statistics and linear regression were used to analysis the data. The results showed that accounting ethical principles significantly influence the quality of financial reports of selected organisations. In the study conducted by Edi and Enzelin (2022) on analysing the effect of accounting ethics toward the quality of financial report, using purposive sampling method. The study employed SPSS to analyse data, measuring each variable with questionnaire data measured with Likert scale. The results of this study showed that professional ethics have significant effect on the quality of financial statements.

H01: Professional ethics has no significant effect on relevance of financial reports of listed firms.

H02: Professional ethics has no significant effect on faithful representation of financial reports of listed firms.

Role of Relevance in Quality Financial Reporting

Improved financial reporting quality, through relevance, leads to presentation of reliable financial information comparable with other capital

markets in a globalized and competitive marketplace where scarce resources are directed towards area of best possible returns (Wurgler, 2000). Hence, the extent to a financial statement would be able to competently influence the decision of stakeholders depend on the relevance of information contained in that financial statement.

Financial and non-financial information is relevant, if it is capable of making a difference in the achievement of the objectives of financial reporting; when it has confirmatory value, predictive value or both for users in making and evaluating economic decisions. The relevance of financial information is influenced by its nature and materiality. Materiality refers to the omission or misstatement of information which could influence economic decisions of users, taken on the basis of the financial reports (IAASB, 2005). Information is material, if omitting it or misstating it could influence decision making. It is required that a financial report should include all information which is material to a particular entity (IASB, 2018). Such information can make a difference if it has: predictive value, confirmatory value, or both. Predictive value means that the information can be used to predict future outcomes while confirmatory value means that the information provides feedback on previous evaluations (i.e. it allows users to confirm or change their opinion on such evaluations).

Role of Faithful Representation in Quality Financial Reporting

Faithful representation provides that financial information, accurately reflects the economic substance of the transactions and events it portrays, rather than just their legal form. It ensures that financial statements are unbiased,

complete, neutral, and free from material errors (Abakasanga, et al., 2019). Completeness implies that all necessary information to understand the underlying economic phenomena should be included in the financial statements. This means avoiding omissions that could mislead users; neutrality provides that the information is presented without bias, meaning it shouldn't favour one party or another i.e. objectively and fairly; and free from error indicated that the information is accurate and reliable, reflecting the true state of affairs (Avi, 2023). Hence, faithful representation ensures that the financial statements provide a true and fair view of a company's financial position and performance, enabling stakeholders to make sound judgments and decisions. Hence, it is a critical aspect in ensuring that the firm's financial reporting is trustworthy and includes all the facts related to a company's performance and condition.

Methodology

This section focused on the methodology to determine professional ethics and fundamental quality of financial reporting, with special interest in the listed firms in Nigeria and South Africa. This study covers a period of ten (10) years, from 2014 to 2023. The study adopted an expo facto design in order to collect detailed and factual information that describes the research topic. The study is a quantitative (parametric) study because it adopted the use of secondary sources which has been prepared and published.

Secondary data remain the only major source of data gathering, it is assumed that before the data were released for public consumption, it must have gone through auditing process, internal control mechanism and other management validation which must have been thoroughly carried

out, hence, validity of data is already established, therefore data were only subjected to variance inflation factor (VIF) and tolerance test so as to established the normality of the data.

Method of Data Analysis

Descriptive and inferential statistics were used to determine the sample characteristics. Zero-order correlations between the dependent variables and the independent variables were conducted. Static panel data regression estimation was performed using Panel Data Regression Model to test the hypotheses and ascertain the contribution of the predictor variables (Professional Ethics) in explaining the variations in Financial Reporting Quality. Statistical Product and Service Solution (formally known as Statistical Packages for Social Sciences – SPSS) version 25 of IBM was employed for data analysis. Panel Data linear model was employed because it provides a conceptual and statistical mechanism for investigating and drawing conclusions regarding the influence of phenomena at different levels of analysis.

Model Specification

This study employs Panel Data Regression Model. A priori expectation was equally presented. This model was adopted from Mafabi (2012), Conway & Lance (2010), and MedGraph method by Jose (2008). This model was modified to accommodate the variables of this study.

Regression Model for Hypotheses

Mathematical Model Expression:

$$FRQ = f(PE) + e.$$

Where:

FRQ = Financial Reporting Quality – Relevance, faithful representation,

PE = Professional Ethics proxied by professional behaviour, objectivity, integrity, and independence.

Descriptive Statistics

Table 3 shows the descriptive statistics for the variables of the study. The study shows the mean value of relevance of financial statement in Nigeria is 2.243 and that of South-Africa (SA) is 3.0725. From this simple descriptive result, it can be seen that the mean value of SA (3.072) is higher than that of Nigeria (2.243) in relation to value relevance of financial statement.

Table 3 further shows that the faithful representation of financial statement of companies in Nigeria is about 2.192, while that of SA companies is about 3.0026. In the same light, the descriptive statistics in table 3 shows that the mean value of understandability of financial statement of records of companies in Nigeria is about 2.759, and that of SA companies is about 3.7803.

Table 3 Descriptive Statistics	Nigeria				South-Africa	
	Min	Max	Mean	Std. Devi- ation	Mean	Std. Devi- ation
To what extent does the presence of the forward looking statement help forming expectations and predictions concerning the future of the company?	1	5	2.2938	1.18652	3.1425	1.6255
To what extent does the presence of non-financial	1	5	2.2143	1.16012	3.0336	1.5894
To what extent does the company use fair value instead of historical cost	1	5	2.2614	1.13833	3.0981	1.5595
To what extent do the reported results provide feedback to users of the annual report as to how various market events and significant transactions affected the company?	1	5	2.2013	1.18187	3.0158	1.6192
Relevance total score	1	5	2.243	1.16671	3.0725	1.5984
Faithful Representation						
To what extent are valid arguments provided to support the decision for certain assumptions and estimates in the annual report?	1	5	2.0974	1.17574	2.8734	1.6108
To what extent does the company base its choice for certain accounting principles on valid arguments?	1	5	2.3506	1.2072	3.2203	1.6539
To what extent does the company, in the discussion of the annual results, highlight the positive events as well as the negative events?	1	5	2.1088	1.16711	2.8891	1.5989
Which type of auditors' report is included in the annual report?	1	5	2.2098	1.20662	3.0274	1.6531
Faithful Representation total score	1	5	2.192	1.18917	3.0026	1.6292

Panel A: Hypothesis One

Table 4 Professional ethics and relevance of financial reports

Variables	Nigeria Model 1			South Africa Model 2		
	B	T	Sig.	B	T	Sig.
Constant	0.733	6.139	0.000	1.407	10.936	0.000
Professional Behaviour	0.591	-2.635	0.000	1.42	12.906	0.000
Objectivity	0.801	-1.236	0.000	1.682	14.062	0.000
Integrity	0.465	1.516	0.055	0.687	7.325	0.000
Independence	0.189	2.628	0.000	0.612	5.497	0.000
F-Statistic	6027.122			3048.783		
Adj. R2	0.907			0.924		

Source: SPSS Version 25 Output

Table 4 shows the effect of professional ethics on relevance of financial reports of listed firms in Nigeria and South Africa. The table shows the adjusted R2 of .907, which implies that professional ethics is about 91% responsible for variation in relevance of financial reports. In the case of firms in Nigeria, professional behaviour (B = 0.59, t = -2.635, p = 0.000) account for about 0.59-unit effect on relevance of financial reports. The t value of -2.64 implies that, professional behaviours of firms that were studies in Nigeria has negative and significant (p = 0.000) effect on relevance of financial reports of listed firms.

Model 2 (South Africa) shows that the adjusted R2 of .92, which implies that professional ethics is about 92% responsible for variation in relevance of financial reports. In the case of firms in South Africa, professional behaviour (B = 1.42, t = 12.906, p = 0.000) account for about 1.42-unit effect on relevance of financial reports. The t value of 12.906 implies that, professional behaviours of firms that were studies in South Africa has positive and significant (p = 0.000) effect on relevance of financial reports of listed firms.

Table 4 (Model 1) shows that objectivity account for about 0.801-unit effect on relevance of financial reports. The t value of -1.236 implies that, objectivity has negative (-1.236) and significant (p = 0.000) effect on relevance of financial reports of listed firms in Nigeria.

In the case of firms in South Africa, objectivity account for about 1.682-unit effect on relevance of financial reports. The t value of 14.062 implies that, objectivity of firms that were studies in South Africa has positive and significant (p =

0.000) effect on relevance of financial reports of listed firms.

Table 4 (Model 1) shows that integrity of Directors accounts for about 0.406-unit effect on relevance of financial reports. The t value of 1.516 implies that, integrity of directors has positive but insignificant (p = 0.055 > 0.005) effect on relevance of financial reports of listed firms in Nigeria.

However, in the case of firms in South Africa, integrity of Directors accounts for about 0.687-unit effect on relevance of financial reports. The t value of 7.325 implies that, integrity of directors of firms that were studies in South Africa has positive and significant (p = 0.000) effect on relevance of financial reports of listed firms. Table 4 (Model 1) shows that independence of directors account for about 0.189-unit effect on relevance of financial reports. The t value of 2.628 implies that, independence of directors has positive and significant (p = 0.000 < 0.005) effect on relevance of financial reports of listed firms in Nigeria.

Similarly, in the case of firms in South Africa, independence of director accounts for about 0.612-unit effect on relevance of financial reports. The t value of 5.497 implies that independence of directors of firms that were studies in South Africa has positive and significant (p = 0.000) effect on relevance of financial reports of listed firms.

Going by the findings from this study, the researcher hereby concluded that professional ethics in Nigeria has no significant effect on relevance of financial reports of listed firms, However, professional ethics in South Africa has positive and significant effect on relevance of financial reports of listed firms.

Panel B: Hypothesis Two**Table 5 Professional ethics and faithful representation of financial reports**

Variables	Nigeria			South Africa		
	Model 1			Model 2		
	B	t	Sig.	B	t	Sig.
Constant	1.684	7.506	0.000	2.921	15.508	0.000
Professional Behaviour	-0.088	-5.528	0.000	1.824	11.321	0.000
Objectivity	0.968	-2.058	0.000	1.85	10.565	0.000
Integrity	2.554	7.504	0.000	1.098	5.713	0.006
Independence	1.13	1.558	0.000	1.147	7.039	0.000
F-Statistic		1.262			49.541	
Adj. R2		0.673			0.877	

Faithful Representation

Table 5 shows the effect of professional ethics on faithful representation of financial reports of listed firms in Nigeria and South Africa. The table shows the adjusted R2 of .907, which implies that professional ethics is about 67% responsible for variation in faithful representation of financial reports. In the case of firms in Nigeria, professional behaviour account for about -0.088-unit effect on faithful representation of financial reports. The t value of -5.528 implies that, professional behaviours of firms that were studies in Nigeria has negative and significant ($p = 0.000$) effect on faithful representation of financial reports of listed firms.

Model 2 (South Africa) shows that the adjusted R2 of .877, which implies that professional ethics is about 88% responsible for variation in faithful representation of financial reports. In the case of firms in South Africa, professional behaviour account for about 1.824-unit effect on faithful representation of financial reports. The t value of 11.321 implies that, professional behaviours of

firms that were studies in South Africa has positive and significant ($p = 0.000$) effect on faithful representation of financial reports of listed firms.

Table 5 (Model 1) shows that objectivity account for about 0.968-unit effect on faithful representation of financial reports. The t value of -2.058 implies that, objectivity has negative and significant ($p = 0.000$) effect on faithful representation of financial reports of listed firms in Nigeria.

In the case of firms in South Africa, objectivity account for about 1.85-unit effect on faithful representation of financial reports. The t value of 10.565 implies that objectivity of firms that were studies in South Africa has positive and significant ($p = 0.000$) effect on faithful representation of financial reports of listed firms.

Model 1 shows that integrity of directors account for about 2.554-unit effect on faithful representation of financial reports. The t value of 7.504 implies that, integrity of directors has positive

and significant ($p = 0.000 < 0.005$) effect on faithful representation of financial reports of listed firms in Nigeria.

However, in the case of firms in South Africa, integrity of directors account for about 1.098-unit effect on faithful representation of financial reports. The t value of 5.713 implies that integrity of directors of firms that were studied in South Africa has positive and significant ($p = 0.000$) effect on faithful representation of financial reports of listed firms.

Table 5 (Model 1) shows that independence of directors account for about 1.13-unit effect on faithful representation of financial reports. The t value of 1.558 implies that independence of directors has positive and significant ($p = 0.000 < 0.005$) effect on faithful representation of financial reports of listed firms in Nigeria.

Similarly, in the case of firms in South Africa, independence of directors account for about 0.612-unit effect on relevance of financial reports. The t value of 5.497 implies that independence of directors of firms that were studied in South Africa has positive and significant ($p = 0.000$) effect on faithful representation of financial reports of listed firms.

Going by the findings from this study, the researcher hereby concluded that professional ethics in Nigeria has less significant effect on faithful representation of financial reports of listed firms, compared with professional ethics in South Africa which has positive and significant effect on relevance of financial reports of listed firms.

Summary of Findings

1. Professional ethics in Nigeria has no signifi-

cant effect on relevance of financial reports of listed firms, However, professional ethics in South Africa has positive and significant effect on relevance of financial reports of listed firms.

2. Professional ethics in Nigeria has less significant effect on faithful representation of financial reports of listed firms, compared with professional ethics in South Africa which has positive and significant effect on relevance of financial reports of listed firms.

Conclusion

This study focused on professional ethics and financial reporting quality: A comparative analysis of listed firms in Nigeria and South Africa. Despite humongous efforts put in place by numerous professional bodies, financial engineering is still a recurring practice as managers and professional practitioners are involved in unethical practices both in the financial (Societe Generale Bank of Nigeria, Oceanic Bank International plc, etc.) and non-financial (Cadbury Nigeria plc and African Petroleum plc) sectors of the economy. This act consists of non-conformity with standards, insider trading, conflict of interest, pursuit of greed, etc. for selfish gains at the expense of the public interest that they are supposed to uphold. These failures of corporate entities have been attributed to professionals and managers, not following the professional codes of conduct, evidenced not only in the poor quality of financial reporting but also in the loss of confidence by the stakeholders who are the end users. Jackson (2010), stated that the international financial and accounting scandals emphasized that regulations may not be sufficient and that corporate governance needs to be driven by individual ethics and moral values and that Nigeria is not excluded from these scandals, essentially

regarding the financial sector involving Societe Generale Bank plc, Oceanic Bank International plc, etc. and non-financial such as Cadbury Nigeria plc and African Petroleum plc.

Recommendations

Arisen from the findings of the study, the following recommendations were raised:

1. Professional bodies in Nigeria should improve on the professional ethics in line with the relevance of financial reports of listed firms similar to that of South-Africa. Hence, ethics of relevance is recommended. This will compel the professional accountants/auditors to perform their duties with ethics of relevance.
2. To ensure faithful representation, professional bodies should encourage professional accountants to perform their responsibilities within the ethical conducts. Ethics of faithful representation is hereby recommended. This specific ethics is expected to address faithful representation of financial reports.

References

- Abakasanga, N.O., Ogbonna, G. N., & Umobong, A. A. (2019). Faithful representation of accounting information and financial performance of quoted banks in Nigeria. *European Journal of Accounting, Auditing and Finance Research*, 7(2), 17-37.
- Alexander, D., & Britton, A. (2000). *Financial reporting*, 5th ed., Thomson Learning.
- Alzoubi, E.S. (2012). Board characteristics and financial reporting quality among Jordanian listed companies: Proposing conceptual framework. *Asian Journal of Finance and Accounting*, 4(1), 245 – 258.
- Avi, M.S. (2023). Understandability of financial reporting requires comprehensive explanations and not mere references to accounting standards or reports attached to financial reporting. *Journal of Economics, Finance, and Management Studies*, 06(04), 1775–1792. <http://dx.doi.org/10.47191/jefms/v6-i4-41>
- Ball, R. (2009). Market and political/regulatory perspectives on the recent accounting scandals. *Journal of Accounting Research*, 47(2), 277-323.
- Barry, M. M. (2022, September 10). Origin of the Theory of Agency: An Account By One of the Theory's Originators. Retrieved from SSRN Electronic Journal: [https://www.researchgate.net/publication/228124397-Origin_of_the_Theory_of_Agency_An_Account_By_One_of_the_Theory's_Originators#:~:text=Stephen%20Ross%20and%20Barry%20Mitnick%20are%20the%20first%20scholars%20to,according%20to%20Mitnick%20\(2006\)%20](https://www.researchgate.net/publication/228124397-Origin_of_the_Theory_of_Agency_An_Account_By_One_of_the_Theory's_Originators#:~:text=Stephen%20Ross%20and%20Barry%20Mitnick%20are%20the%20first%20scholars%20to,according%20to%20Mitnick%20(2006)%20)
- Bushi, K.M. (2019). Professionalism and ethics of accounting in financial reporting: An overview of Nigerian Scenario. *European Scientific Journal*, 15(25), 224 – 238.
- Dibra, R. (2016). Corporate governance failure: The ease of Enron and Parmalat. *European Scientific Journal*, 12(16), 283-290.
- Edi, E., & Enzelin, I. (2022). Analyzing the effect of accounting ethics toward the quality of financial report. *Journal of Accounting, Finance and Auditing Studies* 8(2), 36-53.
- Eisenhardt, K.M. (1989). Agency theory: An assessment and review. *Academy of Management Review*, 14(1), 57 – 74.

- Eyenubo, S.A., Mohamed, M., & Ali, M. (2017). An empirical analysis on the financial reporting quality of the quoted firms in Nigeria. Does audit committee size matter? *International Journal of Academic Research in Business and Social Sciences*, 7(9), 50 – 63.
- FASB (2008). *Financial Accounting Series, statement of financial Accounting Standards No. 1570- 100: Exposure Draft on an improved conceptual framework for financial.* Norwalk.
- IAASB (2005). *ISA 320: Materiality in planning and performing an audit.* Retrieved from
- IASB (2024). *IFRS 18-Presentation and Disclosure in Financial Statements.* IFRS Foundation
- IASB (2018). *Conceptual Framework for Financial Reporting.* IFRS Foundation
- IASB (2018). *IFRS Conceptual Framework for Financial Reporting,* IFRS Foundation.
- IASB (2018). *Conceptual Framework for Financial Reporting.* IFRS Foundation
- IASB (2008). *Exposure draft on an improved conceptual framework for financial reporting: The objective of financial reporting and qualitative characteristics of decision-useful financial reporting information,* London.
- ICAEW (2005). *Agency theory and the role of audit.* *Audit Assurance Faculty*, 1 – 14.
- IFRS Foundation (2024). *IFRS 18: Presentation and Disclosure in financial statements,* IASB.
- IFRS Foundation (2022). *Conceptual framework for financial reporting,* IASB.
- Iheonkhan, I.S. & Hassan, S.T. (2024). The effect of reporting financial quality and practices accounting ethical: Deposit money banks in Nigeria perspective. *International Journal of Management Research and Economics*, 2(4), 250-267.
- Jabbar, A.A. (2017). Decision-usefulness approach to financial reporting: A case for employees. *International Journal of Advanced Engineering, Management and Science*, 3(5), 481 – 487.
- Jensen, M.C., & Meckling, W.H. (1976). Theory of the firm: Management behaviour, agency costs and ownership structure. *Journal of Financial Economics*, 3(3), 305 – 360.
- Jonas, G.J. & Blanchet, J. (2000). “Assessing quality of financial reporting”. *Accounting Horizons*,14(3), 353 – 363.
- Jose, P.E. (2008). *MedGraph-I: A programme to graphically depict mediation among three variables.* The Internet Version, Version 2.0.
- Kwihangana E., & Tarus T. (2024). Effect of ethical accounting practices on quality financial reporting in manufacturing firms in Rwanda: Case of Sulfo Rwanda industries. *Journal of Finance and Accounting*, 8(3), 56-67.
- Landsman, W. R., Maydew, E.L., & Thornock, J.R., (2012). The information content of annual earnings announcements and the mandatory adoption of IFRS. *Journal of Accounting and Economics*,53(1-2), 34 – 54.
- Lodikero, O. (2023). Accounting ethics and quality of financial reports. *World Wide Jour-*

- nal of Multidisciplinary Research and Development, 9(10), 1-4.
- Mafabi, S. (2012). Organizational resilience: Testing the interaction effect of knowledge management and creative climate. Fountain Publishers.
 - Martinez-Ferrero, J., (2014). Consequences of financial reporting quality on corporate performance: Evidence at the international level. *Estudios de Economica*, 41(1), 49 – 88.
 - Mukhlisin, & Anissa, N. (2018). Internal control disclosure, ethics disclosure and earnings management as signal to detect fraudulent financial reporting. *International Journal of Management, Accounting and Economics*, 5(6), 448-460.
 - Naidoo, V. (2021). Ethics in accounting and finance: A South African perspective. *Sustainability Reporting, Ethics, and Strategic Management Strategies for Modern Organizations*, 30 – 41.
 - Nguyen, T.P.H. (2023). The financial reporting quality for commercial banks - Empirical evidence in Vietnam. *International Journal of Professional Business Review*, 8(6), 01-15.
 - Nkuranga W., & Tarus T. (2023). Effect of accounting ethics on quality of financial reporting among listed commercial banks in Rwanda stock exchange. *Journal of Finance and Accounting*, 7(9), 45-68.
 - Oluwagbuyi, O.L., & Olowolaju, M. (2013). Incessant financial scandals in the corporate organisations in Nigeria: Auditors' culpability. *Research Journal of Finance and Accounting*, 4(9), 104-109.
 - Osunwole, O.O., Adeyemi, O.A., & Dunsu, A.T. (2020). The influence of accounting ethics on quality financial reports among accounting practitioners in Ibadan, Oyo state, Nigeria. *Middle European Scientific Bulletin*, 1(7), 77 - 87.
 - Owolabi, S.A., & Omotilewa, O.O. (2020). Public trust and financial reporting gap: Evidence from underlined ethical issues. *International Journal of Research Publications*, 56(1), 98-112.
 - Pourianasab, A. (2000). Professional ethics principle. *Accountant Journal*, 137, 18-22, 70-73.
 - Ram, M. & Tapria, R. (2019). Accounting theory: Concept and importance. *International Journal of Education, Modern Management, Applied Science, and Social Science*, 1(2), 129 – 134.
 - Salaudeen, Y., Ibikunle, J., & Chima, E. (2015). Unethical accounting practices and financial reporting: Evidence from Nigeria. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, 5(2), 143-150.
 - Sahi, A.M. (2023). The influence of qualitative characteristics of accounting information on the quality of financial statements in private commercial banks: Wasit province: A case study, Iraq. *World Journal of Advanced Research and Reviews*, 19(02), 1406–1424.
 - Tang, Q., Chen, H., & Lin, Z. (2016). “How to measure country-level of financial reporting quality?” *Journal of Financial Reporting and Accounting*, 14(2), 230 – 265.

- Wurgler J (2000). Financial markets and the allocation of capital. *Journal of Financial Economics*, 58(1),187-214.
- Zungenen, A.P., Ngwayi, P. W., & Sam-Aleng, M. (2023). Effect of accounting ethics on the quality of financial reports of Nigerian firms (A case study of selected brewery companies). *TSU-International Journal of Accounting and Finance*, 2(1), 8-31.

AI Stimuli fostering Customer Engagement and Value Co-creation Behaviour: A Comprehensive Review of Tourism Industry

Ipsa Bharti,

Research Scholar, Department of Management Studies, Jamia Millia Islamia New Delhi, India, ipsabharti29@gmail.com.

Abstract

The purpose of the study is to map the intellectual landscape on AI stimuli in tourism and to analyse how these stimuli shape customer engagement and value co-creation behaviour. The study also aims to identify the key authors, global contributors, and underlying themes in the domain. The paper follows a Systematic Literature Review (SLR) approach. The review is done in two phases: Bibliometric Analysis is conducted on the selected literature in the first phase, followed by a thematic analysis in the second phase.

Exponential growth was seen from the year 2019, with China and the US as major contributors. Thematic analysis revealed various AI stimuli, such as perceiver personalisation and interactivity, highlighting their connection with customer engagement and value co-creation behaviour. For service providers, the study offered insights on how they can focus their AI investments on areas that will give them strong customer engagement and value co-creation outcomes. The strategic mapping was also done for the other stakeholders in the tourism sector.

To the best of our knowledge, this is the first study to systematically study AI stimuli in tourism using bibliometric and thematic approaches together and understand how they influence customer engagement and value co-creation behaviour. .

Keywords - Artificial Intelligence Stimuli, Customer Engagement, Value Co-Creation Behaviour, Systematic Literature Review, Bibliometric Analysis, Thematic Analysis

Introduction

The tourism sector is one of the most vibrant and dynamic industries. It is shaped by evolving customers' expectations, global developments, and technological advancements (Yepez & Leimgruber, 2024). Lately, Artificial Intelligence (AI) has emerged as a major force of transformation and has introduced new ways for companies to interact with travellers (Tomotaka Hirabayashi, 2025). AI systems are designed to respond to user

behaviour in real-time, to offer personalised and efficient services (Chauhan et al., 2025). One of the most significant changes has been the rise of interactive, AI-driven touchpoints (moments where technology directly engages with customers). These interactions, called AI Stimuli, go beyond tools like chatbots, personalised interfaces, or recommendation systems and are understood as how customers perceive these technologies during their encounter with the services (Gao et al., 2022).

These stimuli are discrete. Along with shaping the overall experience, these stimuli also influence the decision-making of the customers (Kumar et al., 2024; Chen & Prentice, 2024). Unlike broad AI systems that operate in the background, AI Stimuli are visible, immediate, and are intentionally designed to evoke psychological and behavioural responses in real-time (Rafiq et al., 2022; Pham et al., 2024). These stimuli play a central role in supporting value co-creation behaviour (Gao et al., 2022), where both customers and service providers actively contribute to shaping the service experience (Chandra & Rahman, 2023). An industry like tourism, which is ever changing, heavily relies on the co-created services because travellers co-design their journeys by customising itineraries with the help of digital tools, and sharing feedback throughout their trip (Sugathan & Ranjan, 2019). When AI systems are perceived as interactive and personalised, customers are encouraged to get involved further and make the experience feel bespoke and participatory, influencing the process and quality of the value co-created (Huang et al., 2025).

AI has changed the promotion of destinations, service offerings, and made customer experiences personalised. AI has revolutionised the way businesses interact with customers, offering unprecedented levels of personalisation, interactivity, and autonomy in service delivery (Buhalis et al., 2019; Tuo et al., 2021). From AI-powered chatbots and virtual assistants in customer service to predictive analytics and intelligent recommendation systems, AI has changed the dynamics of the industry. As these technologies permeate customer-oriented platforms, understanding their influence on customer engagement and value co-creation behaviour has

become essential for both researchers and industry professionals (Lalicic & Weismayer, 2021; Solakis et al., 2022).

While there is a plethora of empirical studies on the subject, direct and indirect effects of AI on customer engagement and value co-creation have been established; the current literature remains fragmented and lacks a systematic synthesis of its intellectual structure. Some studies have studied the AI stimuli in experimental or survey contexts, but there is limited evidence mapping on how research at this intersection has evolved, or which thematic clusters dominate the field.

Despite the growing research on AI, customer engagement behaviour, and value co-creation, there are no prior studies that have consolidated this literature to identify trends, influential authors, and conceptual linkages. This gap limits the ability of scholars to comprehend the structure and the direction of research in this emerging area. Hence, the following research questions emerge:

RQ1: Who are the key authors and countries contributing to AI research in tourism, and what collaborations exist among them?

RQ2: What are the dominant themes and trends in the literature on AI applications in the tourism industry over the last two decades?

RQ3: What are the gaps that exist in the current literature regarding AI's role in tourism, and what is the future research scope?

The paper begins with a bibliometric analysis to understand the global contributors, map the research trends and identify key contributions in the field, followed by a detailed thematic exploration

of AI stimuli and their potential influence on customer engagement and co-creation behaviour. The study concludes with a critical analysis of the literature, identification of gaps and suggestions for future research.

2. Research Methodology:

2.1. Type of Study:

To ensure that the review process is thorough, transparent and reliable, we followed a systematic review approach proposed by Tranfield et al. (2003) with established guidelines that is particularly followed in management studies (Briner & Denyer, 2012; Denyer & Tranfield, 2009; Rousseau et al., 2008). The SCOPUS database was used to gather the relevant literature. Appropriate keywords were used to form a search query, as

illustrated in Table 2, to extract the articles from the database.

2.2. Inclusion and Exclusion Criteria

A total of 536 articles were identified through the search from the SCOPUS database. Since the search was automated, the extraction process included some data that was irrelevant and did not align with the research objective. After applying a multi-step cleaning process to the raw data, redundant data was removed. Only articles that were in the English language and were published in peer-reviewed journals were selected. The data was further categorised under the domain of Social Sciences and Business and Management. The full inclusion and exclusion criteria are summarised in Table 1 below.

Table 1. Inclusion and Exclusion Criteria

Criterion	Inclusion	Exclusion	Reasoning
Relevance for review question	Relevant	Not relevant	To answer the questions under study
Language	English	Non-English	English is the predominant language used in academic publications.
Research field	Social Sciences, Business and Management	Other disciplines	The research questions are within the chosen field of study.
Type of publication	Peer-reviewed journal articles	Non-peer-reviewed academic papers To maintain a high-quality standard of the study, only peer-reviewed journal articles are selected. Conference papers Working papers	To maintain a high-quality standard of the study, only peer-reviewed journal articles are selected.

Timeline	2000 - 2024	Older than 2000	To gain a comprehensive understanding of market, regulatory, and technological trends, a 20-year timeframe is essential.
----------	-------------	-----------------	--

2.3. Search Query

The focus of the study was to explore the significance of AI on customer engagement and value co-creation in the tourism sector. A combination of keywords such as “Artificial Intelligence”, “Customer Engagement”, “Value co-creation”, and “Tourism” was selected to guide the literature search. Table 2 reflects the search query drafted.

Table 2. Database and Search query

Database	Search Query
SCOPUS	("Artificial Intelligence" OR "AI Technology" OR "AI Systems" OR "Machine Learning" OR "Cognitive Computing" OR "Deep Learning" OR "ANN" OR "Neural Network" OR "Automation" OR "Robotics" OR "Natural Language Processing" OR "NLP" OR "Autonomous Systems" OR "Predictive Analytics" OR "Smart Systems" OR "Data Mining" OR "Artificial Neural Networks" OR "Chatbots" OR "Virtual Assistants" OR "Conversational AI" OR "AI Services" OR "AI-enabled Services" OR "AI Solutions" OR "AI Applications" OR "AI Tools" OR "AI Platforms" OR "Smart Technology" OR "AI-driven Technology" OR "Intelligent Technology" OR “IOT” OR “Internet of Things”) AND ("Engagement" OR "Experience" OR "Customer Engagement" OR "Customer Experience" OR "Customer Involvement" OR "Customer Participation" OR "User Engagement" OR "User Involvement" OR "User Participation" OR "Customer Retention") AND ("Value" OR "Creation" OR "Value Co-creation" OR "Collaborative Value" OR "Customer Value" OR "Value Generation" OR "Value Development" OR "Value Production" OR "Value Enhancement" OR "Shared Value Creation") AND ("Tourism" OR "Travel" OR "Hospitality" OR "Tourist" OR "Hospitality Industry" OR "Leisure Industry" OR "Hotel Industry" OR "Travel Industry" OR "Tourism Industry" OR "Recreation Industry" OR "Tourism Sector" OR "Travel Sector" OR "Leisure Sector" OR "Hospitality Sector" OR "Tourism Services" OR "Travel Services" OR "Tourism Management" OR "Tourism Business" OR "Tourist Services" OR "Tourist Management" OR "Tourism Operations" OR "Hospitality Services" OR "Leisure Services" OR "Vacation Services")

2.4. Selection Process:

The initial search in the SCOPUS database yielded 536 articles. A systematic screening process was then conducted in four stages to refine the retrieved articles. In the first stage, 203 articles were excluded as they were either non-English or did not meet the required article type. The second stage was to identify the duplicate entries from the dataset. Since one database was used, there were no duplicates found and hence, 0 articles were removed. The third stage involved title and abstract screening, where 46 articles were excluded for not aligning with the scope of the study. In the final stage, full-text screening was conducted, but full-text access was unavailable for 76 articles, leading to their exclusion. After completing this rigorous multi-step process, 211 articles were retained for further analysis and review. This systematic approach ensured the selection of a high-quality and relevant dataset for the research. The screening process is illustrated in Figure 1.

Screening Process	Selected Database	SCOPUS
	Extracted	536
	1. Article type & Language (Non English)	203
	2. Duplicates	0
	3. Title and Abstract Screening	46
	4. Full Text Screening (Full Text Not Available for 76 Articles)	211
	Extracted and Screened	211

Figure 1. Screening Process

In total, 211 articles were thoroughly reviewed and analysed. This consolidated analysis has provided valuable insights into the market structure and effectively addressed the review

questions. The results of this synthesis are detailed in the following sections.

2.5 Synthesis Methods

Microsoft Excel was used to organise the extracted data from the SCOPUS database. Vosviewer software was used to conduct bibliometric analysis, and the Bibliometrix package in RStudio was used to conduct thematic and structural analysis.

3. Bibliometric Analysis

This section presents a comprehensive analysis of the selected articles, offering insights into the global perspective, key themes, and gaps identified during the review. This section aims to address the research questions and provide a deeper understanding of the subject area.

3.1. Publication Trend

The statistics related to the year-wise publications from 2000 to 2024 are presented in Figure 2. The figure highlights the increasing academic and industry interest in the field in adopting AI technologies to enhance customer experience and streamline business operations.

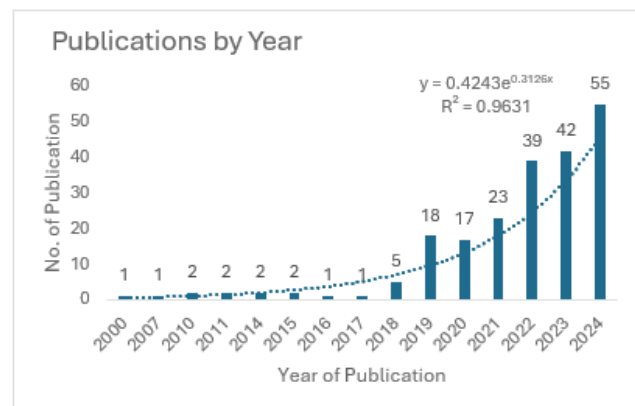


Figure 2. Publication Trend

1. Early Stages (2000-2016):

During the initial phase of research and exploration on AI applications within the tourism domain, between 2000 and 2016, there was a total of 11 publications. Since AI technology was in the early stages of development, there was limited awareness about its potential impact on tourism services and operations.

2. Gradual Growth (2017-2018):

A modest increase in publications was observed around 2017-2018 due to the growing digital transformation across industries. This phase marked the beginning of AI integration in tourism (Samala et al., 2020).

3. Significant Rise (2019-2021)

A noticeable rise in the publications was seen from 2019 to 2021, with 18 and 17 publications in 2019 and 2020, respectively, due to advancements in AI technology and increasing use of this technology in the tourism sector. The sudden interest was reflected in the ongoing efforts made by the industry to meet the evolving expectations of consumers and adopt AI-driven solutions to stay competitive.

4. Exponential Growth (2022-2024):

The publications reached 43 in 2023 and 55 in 2024, indicating a growth in recognition of AI's strategic value in transforming the tourism sector, particularly as the industry sought of solutions in response to the challenges posed by the COVID-19 pandemic and in response to the challenges caused by the COVID-19 pandemic and the subsequent recovery phase.

5. Trend Analysis:

The trendline equation $y=0.4243e^{0.3126x}$, and the high R^2 value of 0.9631 indicated a strong exponential growth pattern, suggesting that AI in tourism has gained momentum faster than ever, with research and practical application expected to continue expanding.

The analysis further showed that had become a key enabler, influencing areas such as customer engagement, operational efficiency, and personalised service delivery. This trend underscored the increasing reliance on AI to enhance tourist experiences, manage business operations more effectively, and provide data-driven insights for decision-making.

As AI technology will continue to evolve, it will likely open new avenues for research and application, solidifying its role in shaping the future of tourism.

3.2. Global Contributions

Contributions from 46 different countries were assembled from the 211 selected literature, as shown in figure 3.

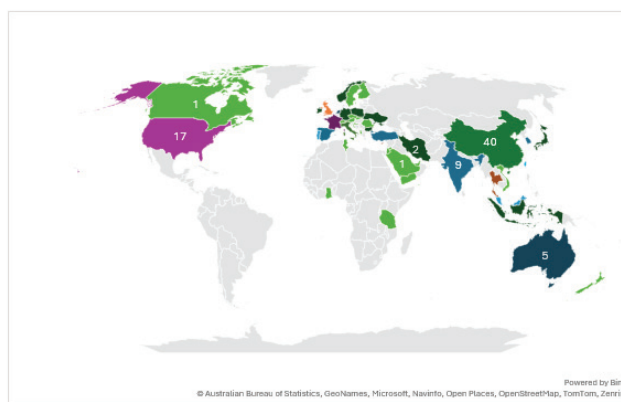


Figure 3. Global Distribution

For country-based analysis, the affiliation countries of the primary authors of the selected studies were independently investigated. Figure 3 highlights the global academic interest in AI's role in tourism, with certain countries emerging as leading contributors.

1. Leading Contributors:

China ranked highest with 40 articles, accounting for 19% of the total publications, reflecting China's significant investment and focus on AI technologies across industries, including tourism, driven by the country's rapid digital transformation. United Kingdom followed with 21 articles (10%), signifying the strong research infrastructure and academic focus on AI in the UK, particularly in the context of service industries like tourism. The United States held a substantial share with 17 articles (8.1%). The U.S, well-known for its technological advancements and its research output in AI, has broad applications in sectors such as travel, hospitality, and tourism.

2. Mid-Level Contributors:

Spain (16 articles, 7.6%) and India (9 articles, 4.3%) had also made notable contributions. Spain's prominence may be driven by its importance as a global tourist destination, encouraging research into AI-driven service improvements. India's contribution reflected its growing IT sector and its applications in AI for various industries. South Korea (9 articles, 4.3%) and Turkey (9 articles, 4.3%) also showed a growing academic focus on AI in tourism, likely driven by their emphasis on technology innovation and service optimization.

3. Emerging Contributors:

Taiwan (8 articles, 3.8%) and Italy (7

articles, 3.3%) showed moderate but increasing engagement with AI research in tourism. France (6 articles, 2.8%) and Australia (5 articles, 2.4%) had growing research communities that are exploring how AI can reshape tourism services and experiences.

4. Lower Contributors:

Several countries like Ghana, New Zealand, Jordan, and Switzerland, among others, contributed smaller shares (0.5%), with one article each. While these countries represented a smaller proportion of the total, they indicated the global spread of interest in AI research, even in regions not traditionally associated with high research output.

3.3. Author Co-citation Analysis

Figure 4 provides a comprehensive overview of key contributors in the field of AI research related to tourism, highlighting their number of publications, total citations, and average citations per article.

Dimitrios Buhalis emerged as the most prominent figure, with 5 publications and an impressive 1,347 citations, averaging 269 citations per article. Authors such as Chulmo Koo and Ulrike Gretzel also demonstrated significant academic influence, with average citations of 205 and 290, respectively. Other scholars, including Srikanth Beldona and Dogan Gursoy, made substantial contributions with fewer publications but relatively high citation counts, reflecting the impact of their work.

Emerging researchers like Choong-Ki Lee and Ipkin Anthony Wong steadily contributed to the literature, though their citation impact is currently moderate.

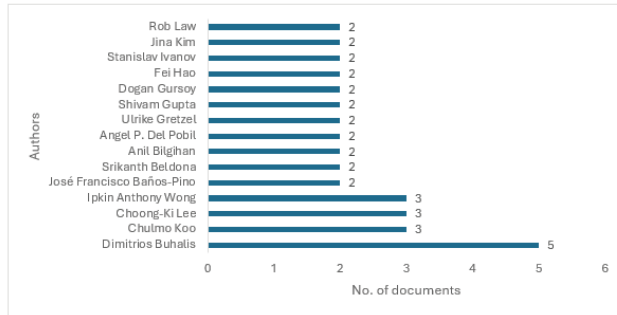


Figure 4. Documents by the authors

3.4. Keyword Co-Occurrence

The keyword co-occurrence network graph, illustrated in Figure 5, encapsulated the dynamic interplay of terms within this expansive research domain.

At the core of this network, Artificial Intelligence stood out with the highest occurrence (48) and a substantial total link strength (92), underscoring its foundational influence on the research landscape. Close by, the term Tourism, with 36 occurrences and a link strength of 79, reflected the deep integration of AI technologies in enhancing service delivery and enriching customer interactions.

Significant supporting themes such as Data Mining (18 occurrences, link strength 47), Deep Learning (16 occurrences, link strength 32), and Customer Satisfaction (17 occurrences, link strength 51) pinpoint specific methodological approaches and focal points within the broader research context. These figures not only highlighted the relevance of these areas but also indicated the robust engagement of the academic community with these topics (Narong & Hallinger, 2023).

Moreover, the presence of emerging topics like Smart Tourism (13 occurrences, link strength

22) and specialized areas such as Virtual Reality (9 occurrences, link strength 19) and Sentiment Analysis (9 occurrences, link strength 24) within the network illustrated their growing impact on the industry’s approach to market segmentation, consumer interaction, and experiential offerings (Narong & Hallinger, 2023; You et al., 2024).



Figure 5. Author Keyword Co-Occurrence Keyword Network Map

3.5. Thematic Analysis

Figure 6 illustrates the strategic map. The map categorized the key thematic areas in AI-related research within the tourism industry based on their development and centrality, offering a comprehensive overview of how these themes interacted and influenced the field.

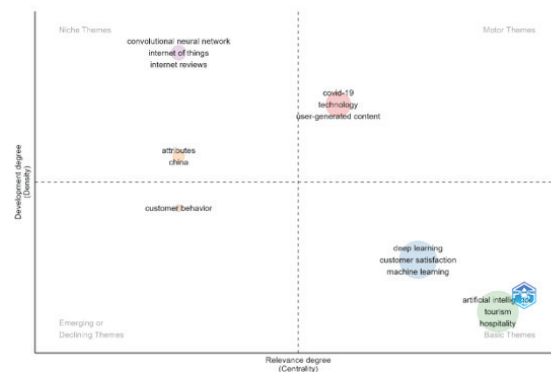


Figure 6. Thematic Map

Motor Themes (Top-Right Quadrant):

Themes: COVID-19, Technology, User-Generated Content

Characteristics: Situated in the top-right quadrant, these themes were both highly central and well-developed and indicated their major influence on the direction of AI in tourism research. The prominence of COVID-19 and Technology highlighted the significant impact of global events and technological advancements on tourism practices and research focus. User-generated content underscored the shift towards consumer-centric data, which was pivotal for AI-driven analytics and personalization strategies. These themes served as hubs, connecting various aspects of AI and tourism research, and are critical for understanding current trends and future directions.

Basic Themes (Bottom-Right Quadrant):

Themes: Artificial Intelligence, Deep Learning, Machine Learning, Tourism, Hospitality

Characteristics: The themes identified were foundational and highly central as they played an essential role across numerous research studies. They exhibited potential for further growth and indicated ongoing advancements in AI technologies and their application in tourism. The inclusion of both broad themes, like tourism and hospitality, and specific themes like AI and machine learning, suggested a strong connection between application and theory. This blend highlighted how applied innovations were increasingly impacting academic discourses, hence influencing industry practices.

Niche Themes (Top-Left Quadrant):

Themes: Convolutional Neural Network,

Internet of Things, Internet Reviews

Characteristics: These themes were well-developed but less central and represented specialised areas of AI applications. They are placed in the top-left quadrant. Although mature in terms of research development, these themes did not connect with other central themes of AI in tourism that were central.

Emerging or Declining Themes (Bottom-Left Quadrant):

Themes: Attributes, China, Customer Behaviour

Characteristics: These themes were characterised by their emerging or declining nature. They indicated the shift in the research focus. The low centrality and developmental scores pointed to areas of interest that were niche and could gain prominence or fade away based on evolving market needs and research areas.

3.6. Multiple Correspondence Analysis (MCA)

To further analyse the identified themes within each cluster, a Multiple Correspondence Analysis (MCA) was conducted. This analysis helped in visualising the relationships among author keywords and exploring the patterns in the data. It also provided insights on how various research themes were grouped across the dataset.

The MCA was conducted using the Biblioshiny application, part of the Bibliometrix R package, which facilitates the analysis of bibliometric data. Author keywords from articles within each cluster were extracted and subjected to MCA to uncover underlying dimensions that explain the variance in the data, thereby revealing

the latent structures within the keywords. The analysis was conducted using the top 60 keywords.

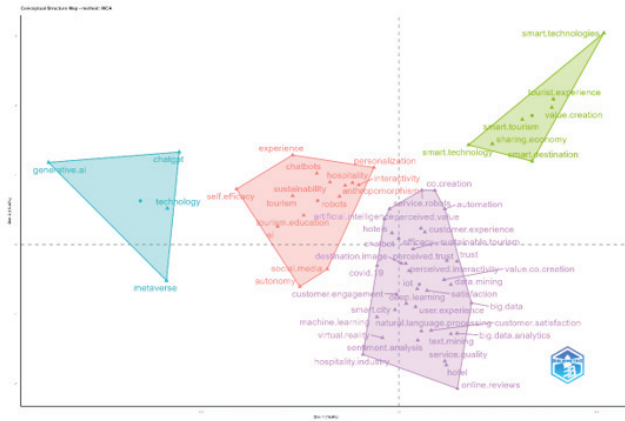


Figure 7. Conceptual Structure Map of Author Keywords Using MCA

The conceptual structure map, Figure 7, displays the four distinct clusters, each representing a unique thematic area. These clusters reveal the primary topics of focus within the literature, highlighting how different concepts are interrelated. Key clusters identified are:

1. Light Blue Cluster: This cluster contains keywords like generative AI, ChatGPT, metaverse, and technology. The focus of this cluster is on cutting-edge technologies that are shaping the future of various industries, including hospitality and tourism.

2. Red Cluster: This cluster highlights how AI technologies like chatbots, service robots, and automation tools are reshaping tourism through enhanced personalisation, interactivity, and trust. Keywords like sustainability and tourism indicate a shift towards seamless experiences. The integration of AI into tourism also reflects a proactive effort to equip future professionals with skills like analytics and smart technologies, reinforcing the role of AI

in shaping co-created travel experiences.

3. Purple Cluster: This cluster includes keywords such as customer experience, satisfaction, service robots, data mining, and natural language processing. The cluster indicates the increasing use of data analytics and AI technologies to enhance customer satisfaction within the domain. It also demonstrates the industry's shift towards automating service delivery to create seamless, personalized experiences for customers.

4. Green Cluster: The cluster with keywords like smart technologies, tourist experience, and value creation suggests a strong link between technological advancements in smart cities and tourism, with smart destinations and smart technology reshaping how tourists engage with destinations.

4. Conclusion

The study offered a comprehensive perspective of the research landscape of how AI stimuli influenced customer engagement and value co-creation behaviour in the tourism industry. Through the SLR followed by a bibliometric analysis and thematic analysis of 211 selected papers, the research identified that there was a significant growth since 2019, with a notable surge in 2023 and 2024. The findings also revealed that Asian and Western Countries have contributed strongly towards the field.

The conceptual structure map highlighted that perceived personalisation, interactivity, trust, autonomy, and self-efficacy were the central AI stimuli that shaped customer experiences in tourism. These stimuli enhanced the service responsiveness and also promoted co-creation behaviours. The

thematic map revealed that, in addition to themes such as AI, tourism, and hospitality, other emerging themes included generative AI, smart tourism, and immersive technologies.

Despite the growing integration of AI technologies in tourism industry, the area is still fragmented with limited research on AI stimuli and its influence on customer engagement and value co-creation behaviour. Most studies focus either on the technological capabilities of AI or customer satisfaction outcomes, leaving a gap in understanding how customers psychologically and behaviourally respond to AI features to engage on a deeper level and co-create value.

5. Implications of the Research

The study addressed the gap by mapping a scattered body of research. The analysis offered a perspective on how AI stimuli are conceptualised and studied about customer engagement and value co-creation. The bibliometric analyses uncovered the core research clusters and evolving themes, helping the researchers to understand the areas of focus and where there is a gap.

The service providers can use the insights from this study to focus their AI investments on areas that will give them strong customer engagement and value co-creation outcomes. The strategic mapping is invaluable for stakeholders in the tourism sector, including researchers, practitioners, and policymakers. By identifying which areas are under-explored and which are oversaturated, the themes guide strategic decision-making in research investment and technology implementation. For instance, investing in emerging technologies or revitalizing declining themes could provide new opportunities for innovation and competitive

advantage. Moreover, understanding the interconnections and the developmental trajectory of these themes helps anticipate future trends and prepare for shifts in the tourism landscape driven by AI advancements.

6. Limitations

While the research provides a comprehensive overview of the domain, it has certain limitations. The analysis relies solely on the SCOPUS database for literature; relevant studies that are indexed in other databases could not be included. It is also possible that literature using different terminologies might have been omitted due to the usage of particular keywords and search strings. Furthermore, the theoretical depth of each study is not reflected as bibliometric indicators represent publication volume and citation frequency. Given the dynamic nature of the industry, the results demonstrate a snapshot in time and could not reflect the most current advancements or patterns that have emerged after the data collection period.

7. Future Scope of the Research

In the future, the researchers can incorporate other databases like Web of Science and Google Scholar for data collection to ensure broader coverage. They can also explore other dimensions of AI stimuli and examine the impact of those on customer engagement and value co-creation behaviour across different demographic contexts. Also, empirical studies on the subject can help build on themes identified in this study and validate the psychological effects of AI-driven interactions in a real-world tourism environment.

References

1. Briner, R. B., & Denyer, D. (2012). Systematic review and evidence synthesis as a practice and scholarship tool. In Oxford University Press eBooks (pp. 112–129). <https://doi.org/10.1093/oxfordhb/9780199763986.013.0007>
2. Buhalis, D., Pesonen, J., Sigala, M., Law, R., Ivanov, S., Webster, C., Kelly, P., Lawlor, J., Mulvey, M., Kazandzhieva, V., Filipova, H., Gretzel, U., Murphy, J., Ukpabi, D., Aslam, B., Karjaluo, H., Naumov, N., Thangiah, S., Karavias, M., . . . Lamb, D. (2019). Robots, artificial intelligence, and service automation in travel, tourism and hospitality. In Emerald Publishing Limited eBooks. <https://doi.org/10.1108/9781787566873>
3. Chandra, B., & Rahman, Z. (2023). Artificial intelligence and value co-creation: a review, conceptual framework and directions for future research. *Journal of Service Theory and Practice*, 34(1), 7–32. <https://doi.org/10.1108/jstp-03-2023-0097>
4. Chauhan, K., Singh, S., & Aggarwal, P. (2025). Reconceptualizing Digital Payments: The enhanced role of AI in transforming financial transactions ecosystem. *Lloyd Business Review*, 210–219. <https://doi.org/10.56595/lbr.v4i1.68>
5. Chen, Y., & Prentice, C. (2024). Integrating artificial intelligence and customer experience. *Australasian Marketing Journal (AMJ)*. <https://doi.org/10.1177/14413582241252904>
6. Denyer, D., & Tranfield, D. (2009). Producing a systematic review. In *The SAGE Handbook of Organizational Research Methods* (pp. 671–689). <http://psycnet.apa.org/record/2010-00924-039>
7. Gao, L., Li, G., Tsai, F., Gao, C., Zhu, M., & Qu, X. (2022). The impact of artificial intelligence stimuli on customer engagement and value co-creation: the moderating role of customer ability readiness. *Journal of Research in Interactive Marketing*, 17(2), 317–333. <https://doi.org/10.1108/jrim-10-2021-0260>
8. Huang, J.-W., Yang, S.-L., & Chang, S.-L. (2025). Impact of Customer Perceptions of Virtual Influencers on Value Co-Creation in Streaming Platforms. *Engineering Proceedings*, 89(1), 29. <https://doi.org/10.3390/engproc2025089029>
9. Kumar, V., Ashraf, A. R., & Nadeem, W. (2024). AI-powered marketing: What, where, and how? *International Journal of Information Management*, 77, 102783. <https://doi.org/10.1016/j.ijinfomgt.2024.102783>
10. Lalicic, L., & Weismayer, C. (2021). Consumers' reasons and perceived value co-creation of using artificial intelligence-enabled travel service agents. *Journal of Business Research*, 129, 891–901. <https://doi.org/10.1016/j.jbusres.2020.11.005>
11. Pham, H. C., Duong, C. D., & Nguyen, G. K. H. (2024). What drives tourists' continuance intention to use ChatGPT for travel services? A stimulus-organism-response perspective. *Journal of Retailing and Consumer Services*, 78, 103758. <https://doi.org/10.1016/j.jretconser.2024.103758>
12. Rafiq, F., Dogra, N., Adil, M., & Wu, J. (2022). Examining consumer's intention to adopt AI-Chatbots in tourism using partial least squares structural equation modeling method. *Mathematics*, 10(13), 2190. <https://doi.org/10.3390/math10132190>

- org/10.3390/math10132190
13. Rousseau, D. M., Manning, J., & Denyer, D. (2008). Evidence in Management and Organizational Science: Assembling the Field's Full Weight of Scientific Knowledge through Syntheses. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.1309606>
 14. Samala, N., Katkam, B. S., Bellamkonda, R. S., & Rodriguez, R. V. (2020). Impact of AI and robotics in the tourism sector: a critical insight. *Journal of Tourism Futures*, 8(1), 73–87. <https://doi.org/10.1108/jtf-07-2019-0065>
 15. Solakis, K., Katsoni, V., Mahmoud, A. B., & Grigoriou, N. (2022). Factors affecting value co-creation through artificial intelligence in tourism: a general literature review. *Journal of Tourism Futures*, 10(1), 116–130. <https://doi.org/10.1108/jtf-06-2021-0157>
 16. Sugathan, P., & Ranjan, K. R. (2019). Co-creating the tourism experience. *Journal of Business Research*, 100, 207–217. <https://doi.org/10.1016/j.jbusres.2019.03.032>
 17. Tomotaka Hirabayashi. (2025). How Generative AI is transforming the tourism industry. In *ey.com*. https://www.ey.com/en_jp/insights/consulting/how-generative-ai-is-transforming-the-tourism-industry
 18. Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing Evidence-Informed management knowledge by means of systematic review. *British Journal of Management*, 14(3), 207–222. <https://doi.org/10.1111/1467-8551.00375>
 19. Tuo, Y., Ning, L., & Zhu, A. (2021). How artificial intelligence will change the future of tourism industry: The practice in China. In *Information and Communication Technologies in Tourism* (pp. 83–94). https://doi.org/10.1007/978-3-030-65785-7_7
 20. Yopez, C., & Leimgruber, W. (2024). The evolving landscape of tourism, travel, and global trade since the Covid-19 pandemic. *Research in Globalization*, 8, 100207. <https://doi.org/10.1016/j.resglo.2024.100207>

Financial Performance Analysis using TOPSIS Technique: A study on select Indian Cement companies

Sunil Tudu

Assistant Professor of Commerce, Hooghly Mohsin College, West Bengal, India. Email-suniltudu02@gmail.com.

Dr. Somnath Das

Associate Professor of Commerce, Kabi Sukanta Mahavidyalaya, Bhadreswar, Hooghly, West Bengal, India. Email- dassomnath211@yahoo.in.

Abstract

Financial performance of companies can be judged very significantly with the help of a technique called Multi-Criteria-Decision -Making (MCDM). Ratio analysis gives some insight of financial health of a company but considering too many ratios at time it become very complex to determine the actual position of company's overall performance. In our study, it has been attempted to analyse the financial performance of 12 conveniently selected large cap Indian cement companies out of 93 large cement companies collected from Cement Information System (CIS), Ministry of Commerce and Industry, Government of India for the period of 2014 to 2023. In the present study we measured as well as ranked the performance of the companies in respect of their liquidity, profitability, efficiency and overall performance by using MCDM method of TOPSIS technique. Total 15 ratios, 5 from each of liquidity, profitability and efficiency criteria have been considered to measure the financial performance. Very interestingly, Entropy weights have been used for ranking the financial performance under TOPSIS technique. Spearman's rank correlation coefficient has been used to determine the correlation between liquidity, profitability, efficiency and overall performance and found that there has been strong correlation between the rank of liquidity, profitability and overall performance..

Keywords - Words: MCDM, TOPSIS, liquidity, profitability, efficiency ratio.

Introduction

Many researchers have worked on measuring financial performance of Indian cement companies from the view point of liquidity, profitability and efficiency. Profit is the most important element for the survival of the business in the competitive environment. According to Keynes, "profit is the engine that derived the business enterprise". The

analysis of the profitability ratio is important for the shareholders, creditors, prospective investors, bankers and Government (Hemalatha, S. et al. (2018). Kumar, M.S. et al. (2015) measured the profitability position and growth of 5 listed companies. Venkatacham, R, et al. (2016) investigate the factors effecting the profitability during the period of 2006-2007 to 2015-2016. Pavithra,

K. (2022) measured the financial performance with the help of profitability ratios and mainly focused on trend analysis. Panigrahi, A. K. (2013) examined the liquidity position of 5 leading listed companies; Geetha, T. N. et al. (2014) evaluated the overall efficiency of selected cement companies by using different financial ratios with DEA analysis. Kumar, R. (2016) evaluated the financial performance of 10 listed Indian cement companies under TOPSIS technique with average weight. Ratio analysis is an important tool to measure the financial performance of a company. But difficulties arise when we consider too many ratios (criteria) to measure the financial performance among the large number of companies and ranked according to their performance. Multi-Criteria-Decision-Making (MCDM) model play a very vital role to determine rank prominently of the companies as per their performance. VIKOR, TOPSIS, DEMATEL are very important methods in this respect. There are very few mentionable works to analyse the financial performance of cement companies in India under MCDM method. In order to bridge this gap in the present study, we attempted to analyse the financial performance of 12 selected cement companies of India using TOPSIS technique.

Objectives

The objectives of our study are,

1. To evaluate the liquidity position of selected cement companies under the study.
2. To examine the profitability position of selected cement companies under the study
3. To identify the efficiency position of the cement companies under the study.
4. To determine the overall rank of the selected companies under the study with the help of

TOPSIS technique.

Survey of existing literature:

Erkhembaatar & Bataa (2020), focused on Entropy Weight Method for Evaluating Indicators of ICT Development Index. They mentioned that entropy weight was developed by Claude E. Shannon in the middle of the 20th century mainly for interest of communication engineering purely based on statistics and probability theory. In this paper the considered ICT Development Index (IDI) which is the combination of 11 indicators to measure the development of different countries and determine weight of each indicator on the basis of certain formula. Here they attempted to determine the indicators of IDI by entropy method and concluded that entropy weight theory firmly focused on the relative position of each ICT indicator data set.

Kharusi & Başci (2017), investigated financial performance of 16 different financial institutions in Oman by using TOPSIS technique for the period of 2001 to 2015. 9 commercial banks, 3 specialized banks, 2 investment companies, and 2 finance companies were selected for this purpose. All the data were secondary data and collected from company's website, annual report etc. Deposits & short-term funding, Total assets, return on average assets (ROAA), Return on average equity (ROAE), Loan loss res / gross loans, Cost to income ratio and Number of employees were used as a variable for TOPSIS analysis. Spearman's Rho (Rank-Order) Correlation was used to assess the rank result correlation of different years. Spearman's Rho Correlation analysis showed strong relationships between two ranked variables.

Türegün (2022), measured the financial

performance of 10 tourism companies at Borsa Istanbul, Turkey for the period of 2018 to 2020 by applying multi-criteria decision-making technique such as TOPSIS and VIKOR. Entropy method was adopted to determine weight of different criterion used in TOPSIS and VIKOR. All the data were secondary data and were collected from public disclosure platform of Borsa Istanbul Stock Exchange (BIST). 20 ratios in 6 categories such as liquidity, activity, financial structure, profitability, market and growth were considered to measure the performance. It was observed both TOPSIS and VIKOR method almost same rank.

Hemalatha & Kmalavalli (2018), evaluated the profitability of 15 cement companies in India during the period from 2005 to 2015. All the secondary data were collected from Capitaline Plus database. Different ratios and statistical tools such as mean, coefficient of variation, correlation and multiple regression were used for analytical purpose. Correlation analysis revealed that, there exist positive relationship between gross profit ratio, net profit ratio, operating profit ratio and also with the return on equity.

Venkatacham & Kasthuri (2016), attempted to evaluate the financial performance of Cement Industry in India with a view to financial performance and investigate the factors effecting on profitability during the period of 2006 to 2016 by using secondary data. Different financial and statistical tool like ANOVA were used to analyse the data. It was concluded all the ratios such as current ratio, liquidity ratio, net profit ratio, Debt Equity Ratio, Interest Coverage Ratio had been used here have positive impact on profitability positions of the cement industry in India.

Venkatacham & Kasthuri (2016), evaluated the overall efficiency by analysing the data of 17 selected Indian cement companies for the period from 2001-2002 to 2012-2013 by using secondary data and were collected from Economic Survey of India, Central Statistical Organization etc. Compound Aggregate Growth rate (CAGR), different financial ratios and DEA analysis were used as tools for analysis the data. The result showed the improvement of performance efficiency of the Indian cement industry during the period of study.

Panigrahi (2013), attempted to examine the liquidity position of 5 leading listed Indian cement companies in order to examine the management of working capital and compare the liquidity position during the period of 2001 to 2010 by using secondary data collected from Annual reports of the companies and the website www.moneycontrol.com. Percentage method, mean, standard deviation, coefficient of variation, Ratio Analysis, Motaal's Ultimate Rank Test were used as tools and technique to analyse the data. It was concluded that, in all companies growth rate of current liabilities were higher than current assets.

Kumar R. (2016), evaluated the financial performance of 10 major cement companies in India selected from the list of NSE under the TOPSIS method for the period of 2011 to 2015. All secondary data were collected from website of the companies. 16 financial ratios used as criteria, average weight was assigned for each criterion for TOPSIS analysis, Spearman correlation was used for financial analysis. They found a low association between the rank determine by TOPSIS and the rank on the basis of capitalization.

Methodology of the study:

Sample design: Cement Information System (CIS), Department for Promotion of Industry and Internal Trade, Government of India, Ministry of Commerce and Industry provide the list of 93 large cement companies in India out of which 12 large companies have selected by convenient sampling method for this study. These companies are Star Cement Ltd., Ultra Tech Cement Ltd., Barak Valley Cement Ltd., Chettinad Cement Corporation Ltd., Gujarat Sidhee Cement Ltd.; Heidelberg Cement India Ltd.; Hemadri Cement Ltd.; India Cements Ltd.; JK Cements Ltd.; Jaiprakash Associates Ltd.; Jaypee Cement Corporation Ltd. and JK Lakshmi Cement Ltd.

Collection of data: All the data used in this study are secondary data and collected for the period of 2014 to 2023 from Capital Line Corporate Database.

Data analysis: Different mathematical tools like average, percentage and various types of ratios, statistical tool such as Spearman's rank correlation and tables, TOPSIS technique with entropy weightage method have used for analytical purpose.

For the purpose of liquidity analysis of the companies under the study the following 5 ratios have been taken into account, such as Cash Flow to Net Income Ratio (CFNIR), Current Liability Coverage Ratio (CLCR), Cash Interest Coverage Ratio (CICR), Current Ratio (CR) and Liquid Ratio (LR).

For profitability analysis the following 5 ratios have been taken, such as Gross Profit Ratio (GPR), Net Profit Ratio (NPR), Operating Profit

Ratio (OPR), Operating Ratio (OR) and Return on Capital Employed (ROCE).

For analyzing the efficiency of the companies under the studies the following 5 ratios have been considered, such as Inventory Turnover Ratio (ITR), Debtors Turnover Ratio (DTR), Working Capital Turnover Ratio (WCTR), Fixed Asset Turnover Ratio (FATR) and Capital Employed Turnover Ratio (CETR).

TOPSIS (Technique for order preference by similarity to ideal solution) method:

The TOPSIS method which was developed by Hwang and Yoon (1981) compare a set of alternatives by identifying weight for each criterion. TOPSIS method helps to solve the multi-criteria decision-making problem by considering the geometric distance from both positive and negative ideal value. This method consists of following steps in order to reach the final solution: -

1. Formation of decision matrix $(X_{ij})_{m \times n}$

Here, Decision matrix is consisting of 10 alternatives companies (m) and 15 criteria or financial ratios (n). The score of each alternative with respect to each criterion is given as X_{ij} and then the matrix is formed as below-

$$(X_{ij})_{m \times n} = \begin{bmatrix} X_{11} & X_{12} & \dots & X_{1n} \\ X_{21} & X_{22} & & X_{2n} \\ \vdots & \vdots & & \vdots \\ X_{m1} & X_{m2} & & X_{mn} \end{bmatrix}$$

1. Normalize the decision matrix:

$$X_{ij} = \frac{r_{ij}}{\sqrt{\sum_{i=1}^m r_{ij}^2}} \quad i = 1, 2, \dots, m; j = 1, 2, \dots, n$$

$$R = (X_{ij})_{m \times n} = \begin{bmatrix} r_{11} & r_{12} & \dots & r_{1n} \\ r_{21} & r_{22} & & r_{2n} \\ \vdots & \vdots & & \vdots \\ r_{m1} & r_{m2} & & r_{mn} \end{bmatrix}$$

2. Calculation of weighted normalized matrix.

$$V_{ij} = W_j r_{ij} \quad i = 1, 2, \dots, m; j = 1, 2, \dots, n$$

Where, W_j is the weight of the j th criteria or attribute, calculated by entropy method. Entropy is one of the objective methods to determine weight and this method was developed by Claude E. Shannon in the middle of the 20th century purely based on statistics and probability theory. The entropy method for determining the relative importance of criteria is calculated by using material data for each criterion, the entropy of the set of normalized outcomes of the j th criterion is given by

$$e_j = \frac{-1}{\ln(m)} \sum_{i=1}^m n_{ij} \ln(n_{ij})$$

Where, $i = 1, 2, 3, \dots, m$; and $j = 1, 2, 3, \dots, n$;

e_j is the information entropy value for j th criteria.

Where, n_{ij} is the normalized decision matrix and is given by,

$$n_{ij} = \frac{X_{ij}}{\sqrt{\sum_{i=1}^m X_{ij}^2}} \quad i = 1, 2, \dots, m; j = 1, 2, \dots, n$$

$$\sqrt{\sum_{i=1}^m X_{ij}^2}$$

Where, X_{ij} is the element of decision matrix.

The degree of diversity (d_j) possessed by each criterion is evaluated as

$$d_j = 1 - e_j, \quad j = 1, 2, 3, \dots, n$$

The weight value (w_j) of each criterion is given by

$$w_j = \frac{d_j}{\sum_{i=1}^m d_j}$$

$$V_{ij} = \begin{bmatrix} w_1 r_{11} & w_2 r_{12} & \dots & w_n r_{1n} \\ w_1 r_{21} & w_2 r_{22} & & w_n r_{2n} \\ \vdots & \vdots & & \vdots \\ w_{m1} r_{m1} & w_{m2} r_{m2} & & w_n r_{mn} \end{bmatrix}$$

3. Determination of the positive or best ideal solution and negative or worse ideal solution.

Positive ideal solution (V_j^+) is the best performance of each matrix column or criteria of the weighted normalization Decision matrix

and negative ideal solution (V_j^-) is the worst performance of each matrix column or criteria of the weighted normalization Decision matrix.

4. Calculation of the Euclidean distance form ideal best.

It determines the closest position to positive ideal solution. The distances to the positive ideal solution of each alternative are calculated by the Euclidean distance approach, using the values in the weighted normalization matrix and the values in the positive ideal solution clusters.

$$V_{ij} = W_j r_{ij} \quad i = 1, 2, \dots, m; \quad j = 1, 2, \dots, n$$

5. Calculation of the Euclidean distance form ideal worse.

It is the farthest position to negative ideal solution. The distances to the negative ideal solution of each alternative are calculated by the Euclidean distance approach, using the values in the weighted normalization matrix and the values in the negative ideal solution clusters.

$$S_i^- = \sqrt{\sum_{j=1}^m (V_{ij} - V_j^-)^2} \quad i = 1, 2, \dots, m; \quad j = 1, 2, \dots, n$$

6. Calculation of performance score or the correspondence closeness coefficient of the ith alternatives.

$$C_i = \frac{S_i^-}{(S_i^+ + S_i^-)}; \quad 0 \leq C_i \leq 1$$

C_i = The closeness coefficient of each alternative

7. Rank of the Companies.

Ranking of alternatives is determined by comparing values of C_i . The highest relative closeness value is the ideal alternative and considered as the best alternative in terms of the related multi-criteria decision-making problem and ranked 1.

Analysis and interpretation:

Table No.1

Liquidity position of the 12 selected cement companies during the period of 2014 -23 under TOPSIS technique.

Companies Name	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	TOTAL	RANK
Star	7	4	3	2	2	4	3	7	9	7	48	3
Ultratech	3	2	5	6	6	9	9	2	5	3	50	4
Barak Valley	12	11	11	9	8	10	2	10	4	12	89	10
Chettinad	4	3	2	1	1	1	4	3	3	4	26	1
Sidhee	2	6	8	10	3	12	12	11	12	2	78	9
Heidelberg	11	8	6	5	5	7	5	4	7	10	68	6
Hemadri	1	12	1	3	11	2	1	1	1	1	34	2
India Cem	10	1	7	12	9	8	6	5	2	11	71	8
JK Cement	6	5	4	4	4	6	8	6	8	6	57	5
Jaiprakash	8	9	12	11	10	11	11	8	10	8	98	12
Jaypee	9	10	10	8	12	3	10	9	11	9	91	11
JK Lakshmi	5	7	9	7	7	5	7	12	6	5	70	7

Table No.1 represents the liquidity position of the selected 12 cement companies during the period

under study using TOPSIS method. It is observed that liquidity position of Chettinad Cement Corporation Ltd. has been invariably good and occupied 1st position. Hemadri Cement Ltd.'s performance in term of liquidity is also very consistent except in 2022 and 2019 and hold 2nd position. The liquidity position of Star Cement Ltd. during the period of study showed quite consistent from 2017 to 2022 but slide down in 2014, 2015, 2016 and 2023 as a result it occupied 3rd position. Ultra Tech Cement Ltd. and JK Cement Ltd. also performed satisfactory in term of liquidity and occupied 4th and 5th position. The Liquidity performance of Barak Valley Cement Ltd.; Jaypee Cement Corporation Ltd. and Jaiprakash Associates Ltd. are very poor and occupied 10th, 11th and 12th position out of the selected cement companies during the period of study.

Table No.2

Profitability position of 12 selected cement companies during the period of 2014 -23 under TOPSIS technique.

Companies Name	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	TOTAL	RANK
Star	4	6	4	1	1	2	3	4	6	9	40	3
Ultratech	2	4	2	3	6	3	2	1	1	1	25	1
Barak Valley	5	10	9	7	7	9	9	10	8	8	82	9
Chettinad	1	1	5	6	2	1	1	3	3	2	25	1
Sidhee	8	7	7	10	5	11	10	9	10	3	80	8
Heidelberg	6	2	1	2	3	5	5	7	7	10	48	5
Hemadri	11	9	10	9	9	10	6	2	2	7	75	7
India Cem	9	8	8	8	10	8	7	5	9	11	83	10
JK Cement	3	3	3	4	4	4	4	6	4	5	40	3
Jaiprakash	10	11	11	11	11	6	12	12	11	6	101	11
Jaypee	12	12	12	12	12	12	11	11	12	12	118	12
JK Lakshmi	7	5	6	5	8	7	8	8	5	4	63	6

Table No.2 depicts the profitability position of 12 selected cement companies for the study period of 2014-2023 using TOPSIS technique. We observed that the performance of Ultra Tech Cement Ltd. and Chettinad Cement Corporation Ltd. have been performed much consistent during the period and profitability position under TOPSIS method of both companies is same and occupied 1st position. The Performance of the Star Cement Ltd. and JK Cement Ltd. is remarkable good. The sum of TOPSIS positional score in term of profitability of both the companies is identical and occupied 3rd position. Heidelberg Cement India Ltd. also showed its progressive performance in profitability and holds 5th position and JK Lakshmi Cement Ltd. Holds 6th position. The performance of India Cements Ltd., Jaiprakash Associates Ltd. and Jaypee Cement Corporation Ltd. is very poor during the period of study and occupied 10th 11th and 12th position out of the selected cement companies.

Table No.3

Efficiency position of 12 selected cement companies during the period of 2014 -23 under TOPSIS technique.

Companies Name	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	TOTAL	RANK
Star	3	3	6	4	6	8	5	6	8	8	57	4
Ultratech	12	10	11	1	3	6	7	4	12	1	67	7
Barak Valley	8	9	8	3	2	12	8	5	6	9	70	8
Chettinad	9	7	9	11	10	9	9	7	5	6	82	11
Sidhee	5	5	1	10	4	2	2	1	2	5	37	2
Heidelberg	4	2	2	2	1	1	1	11	1	2	27	1
Hemadri	7	6	5	5	5	5	3	2	3	12	53	3
India Cem	10	11	3	6	9	10	10	12	4	4	79	10
JK Cement	6	8	4	7	7	4	6	3	7	7	59	5
Jaiprakash	11	12	10	12	12	11	12	9	10	10	109	12
Jaypee	2	4	7	8	11	7	11	8	9	11	78	9
JK Lakshmi	1	1	12	9	8	3	4	10	11	3	62	6

Table No.3 represents the efficiency position of 12 selected cement companies during the period of 2014-2023. It is observed that except in the year 2016 Heidelberg Cement India Ltd.'s performance has been more consistent during the period of study that indicates the company is able to marshalling its assets more effectively and occupied 1st position. Except in the year 2020 the performance of Gujarat Sidhee Cement Ltd.is noticeable good and hold 2nd position. Hemadri Cement Ltd. and Star Cement Ltd. Also exhibits mentionable performance in respect of efficiency and secure 3rd position and 4th position respectively. Both the companies showed remarkable improvement during the period of study. JK Cement Ltd. exhibits almost same level of performance and able to hold 5th position. Again, India Cements Ltd. and Jaiprakash Associates Ltd. continued very poor performance and occupied 10th and 12th position respectively. It is noticeable that though Chettinad Cement Corporation Ltd. performed significantly good in term of liquidity and profitability but in efficiency its performance is very poor and occupied 11th position out of the 12 selected companies, which indicates this company unable to utilise its asset in significant manner and require to improve it.

Table No. 4

Overall Performance of 12 selected cement companies during the period of 2014 -23 under TOPSIS Rank

Companies Name	Liquidity Rank	Profitability Rank	Efficiency Rank	Sum Total	Overall Rank
Star	3	3	4	10	1
Ultratech	4	1	7	12	2
Barak Valley	10	9	8	27	9
Chettinad	1	1	11	13	5
Sidhee	9	8	2	19	7
Heidelberg	6	5	1	12	2
Hemadri	2	7	3	12	2
India Cem	8	10	10	28	10
JK Cement	5	3	5	13	5
Jaiprakash	12	11	12	35	12
Jaypee	11	12	9	32	11
JK Lakshmi	7	6	6	19	7

Table No. 4 represents the Overall Performance of 12 selected cement companies during the period of 2014-23 on the basis of TOPSIS Rank. The rank of Liquidity, profitability and efficiency of Star Cement Ltd. is quite notably consistent hence, occupied 1st position. Though Ultra Tech Cement Ltd. ranked 1 in profitability and liquidity position is quite satisfactory but slide down in efficiency rank as a result it occupied 2nd position in overall. It is also noticeable Heidelberg Cement India Ltd. ranked no.1 in efficiency but liquidity and profitability position is not so satisfactory that effect its overall performance rank and share the position 2 with Ultra Tech Cement Ltd. and Hemadri Cement Ltd. The liquidity and profitability rank of Chettinad Cement Corporation Ltd. is remarkably good but efficiency position is very poor which effect its overall position and ranked 5th. JK Cement Ltd. also shares the 5th rank with Chettinad Cement Corporation Ltd. Since, India Cements Ltd., Jaypee Cement Corporation Ltd. and Jaiprakash Associates Ltd. all ranked very poor in respect of liquidity, profitability and efficiency that also reflected in their overall position and ranked 10th, 11th and 12th out of the 12 selected cement companies.

Table No.5

Criterion	Rank Correlation
Liquidity and Profitability (P12)	0.832168
Liquidity and Efficiency (P13)	0.307692
Liquidity and Overall (P14)	0.828671
Profitability and Efficiency (P23)	0.230769
Profitability and Overall (P24)	0.77972
Efficiency and Overall (P34)	0.63986

Table No. 5 shows the rank of correlation coefficients among the different determinants. It exhibits that there is a strong and positive rank correlation among the rank of liquidity, profitability, efficiency and overall performance. The result of rank correlation between liquidity and profitability (P12) is 0.832168, liquidity and overall performance (P14) is 0.82671, profitability and overall performance (P24) is 0.77972 and efficiency and overall performance (P34) is 0.63986 which indicates a very strong positive rank correlation among the criterion. On the other hand, the rank correlation between liquidity and efficiency (P13) is 0.307692 and profitability and efficiency (P23) is 0.230769 which indicates a moderate strong positive correlation among criterion.

Conclusion: Star Cement Ltd. is the best performing cement company and ranked 1st since its liquidity, profitability and efficiency performances are very consistent and identical during the period of study. It is noticeable that the Ultra Tech Cement Ltd., Heidelberg Cement India Ltd. and Hemadri Cement Ltd. all ranked 2nd. Though Ultra Tech Cement Ltd. is ranked 1st in respect of profitability and its liquidity position is quite satisfactory but poor in respect of efficiency and as a result it occupied 2nd position in overall performance. Ultra Tech Cement Ltd. requires improving its efficiency. Heidelberg Cement India Ltd. is performing very efficiently with moderate liquidity position but needs to improve its profitability. Hemadri Cement Ltd. is also has to give emphasis to improve its profitability position. Chettinad Cement Corporation Ltd. performed significantly well in liquidity and profitability and occupied 5th position with JK Cement Ltd., in terms of overall position but performed very poor in efficiency, thus

the company has to improve efficiency in order to improve its overall performance position. JK Cement Ltd. also gives importance to improve its liquidity and efficiency in order improves its overall position. India Cements Ltd., Jaypee Cement Corporation Ltd. and Jaiprakash Associates Ltd. all need to improve their liquidity, profitability and efficiency in order to improve their overall position.

References

- Erkhembaatar, N., & Bataa, O. (2020, December). ENTROPY WEIGHT METHOD FOR EVALUATING INDICATORS OF ICT DEVELOPMENT INDEX. *International Journal of Current Advanced Research*, 9(12), 23500-23504.
- Geetha, T. N., & Ramasamy, S. (2014). A Study on the Performance Efficiency of Selected Cement Industries in India. *International Journal of Modern Science and Engineering Technology (IJMSET)*, 1(2), 57-62. Retrieved from <https://www.ijmset.com>
- Hemalatha, S., & Kmalavalli, A. L. (2018). Profitability analysis of Cement Companies in India. *International Journal of Current Research and Modern Education (IJCRME)*, 3(1), 303-308. Retrieved from <http://www.rd-modernresearch.com>
- Kharusi, S. A., & Başı, E. (2017, March). Financial institutions performance evaluation in a unique developing market. *Banks and Bank Systems*, 12(1), 54-59.
- Kumar, R. (2016, December). Financial Performance Evaluation of Cement-Majors in India: An Application of TOPSIS method. *Asian Journal of Technology and Management Research (AJTMR)*, 06(02), 18-22. Retrieved from <https://www.researchgate.net/publication/>

- Panigrahi, A. K. (2013, November-December). Liquidity Management of Indian Cement Companies – A Comparative Study. IOSR Journal of Business and Management (IOSR-JBM), 14(5), 49-61. Retrieved from <http://www.iosrjournals.org>
- Venkatacham, R., & Kasthuri, V. (2016, July - August). A study on financial performance of cement industry in India. International Journal of Applied Research 2, 2(9), 778-780. Retrieved from <http://www.allresearchjournal.com>
- Türegün, N. (2022). Financial performance evaluation by multi-criteria. Heliyon, 2-13. Retrieved 4 24, 2024, from <https://doi.org/10.1016/j.heliyon.2022.e09361>

Spirituality Management In The Pharmaceutical Sector In India

Dr. Hamendra Dangi,

Professor, Delhi University. hkdangi@commerce.du.ac.in

Dr. Gurpreet Kaur

Associate Professor, Rukmini Devi Institute of Advanced Studies , gurukaman@yahoo.com.

Abstract

The study is based on systematic literature review on the impact of spirituality management on the pharmaceutical sector. The objective is to find out the relevance of spirituality management on the pharmaceutical sector. The ISM technique is used in this study's systematic literature review (SLR) to examine how spirituality management (SM) impacts affect the pharmaceutical sector in India. The study chooses academic publications from the database between 2000 and 2024 using particular parameters. 200 articles were chosen after going through a multiple screening process that revealed relevant patterns and insights into how spirituality affects the ethical practices in the pharmaceutical sector. The prominent themes are as follows - organizational culture where compassion, integrity, responsibility, and purpose align with business practices to enhance employee well-being, corporate social responsibility (CSR), and ethical drug development and distribution. The study will impact on the globalization and ethical global business practices by reduced burnout and improved employee retention..

Keywords - Spirituality Management, CSR, Organisational Culture, Ethical Global Practices.

Introduction

Spirituality management in the context of organizations refers to the practice of integrating spiritual values, practices, and well-being into organizational culture, leadership, and employee relations. It emphasizes the importance of aligning personal values with organizational goals, fostering a deeper sense of purpose, well-being, and interconnectedness among employees. Duchon (2012) this study developed a measure for workplace spirituality tailored to the Asian context, highlighting the importance of spirituality in promoting employee well-being, fostering trust, and enhancing organizational performance. Reave (2016) explores the influence of spiritual values on

ethical decision-making in the workplace, arguing that spiritual practices such as mindfulness and compassion can lead to more ethical leadership and organizational culture. This concept is becoming increasingly relevant in the modern corporate world as companies seek to create supportive work environments that go beyond the purely material or transactional aspects of work. Spirituality in the workplace refers to the recognition and integration of an individual's inner life and values within the context of professional environments. It includes fostering a sense of purpose, personal growth, ethical values, and a deep sense of connection among employees. Spirituality management is not about promoting religion but rather creating a work environment where individuals can express their

values, experience a sense of meaning, and align their professional work with their personal beliefs. Plowman (2019) explores the role of mindfulness and spiritual practices in shaping organizational culture, showing that organizations that encourage such practices see improvements in creativity, collaboration, and overall culture. Saks (2022) states through the meta-analysis consolidates research on the relationship between workplace spirituality and employee well-being, concluding that organizations that promote spiritual values see higher levels of employee satisfaction, engagement, and retention. In a rapidly changing world, people are seeking meaning and purpose in their work. Companies that embrace spirituality management acknowledge that employees are not just workers but individuals with emotional, mental, and spiritual needs. Hassan (2023) in his systematic review synthesizes evidence from various studies, showing that spirituality in the workplace strengthens organizational commitment, particularly in sectors requiring high levels of emotional labour or ethical decision-making.

Pharmaceutical Sector in India

The pharmaceutical sector in India is one of the largest and most dynamic in the world, and it plays a significant role in the global pharmaceutical market. Ghosh (2015) discuss the evolving landscape of the Indian pharmaceutical sector, with a particular focus on regulatory challenges, intellectual property rights, and the increasing competition from both domestic and international players. They highlight the potential for growth in emerging markets. Kumar (2018) explores the impact of India's drug regulations on pharmaceutical companies. The authors examine the challenges in navigating complex regulatory

environments, focusing on the approval process for new drugs, pricing policies, and the challenges posed by generic drug markets. Growth Global Position in India is the world's third-largest producer of pharmaceuticals by volume and the thirteenth-largest by value. The sector contributes significantly to global supply, especially for generic drugs. Kaur (2021) highlights the increasing emphasis on corporate social responsibility (CSR) in the Indian pharmaceutical industry. The authors examine how pharmaceutical companies are integrating sustainability practices, both in terms of environmental impact and social initiatives, to meet consumer expectations and global standards. Chauhan (2024) reviews recent pharmaceutical regulatory reforms in India, including changes in drug approval processes, price control mechanisms, and patent laws. The authors assess how these reforms are reshaping the industry and influencing both domestic companies and foreign investors.

Antecedents of spirituality Management in the Pharma Sector

Gavaza (2023) in his paper, Pharmacy students' perceived barriers to spiritual care: A qualitative study to investigate pharmacy students' perceived barriers to incorporating SC in pharmacy practice. Major barriers to SC include lack of time for SC, lack of supervisor and company support for SC, and discordant pharmacist-patient spiritual beliefs. Future studies should be conducted to investigate these and other barriers to SC in pharmacy practice. Kotze (2022) aimed to determine the dimensionality associated with a measure of workplace spirituality and whether the estimated primary factor scores (alignment with organisational values, meaningful work, sense of community) outperforms the prediction

of the estimated scores for perceived employee performance compared with the estimated scores for the general factor (workplace spirituality). Ilyas (2020) Spiritual values and work-related wellbeing of Indian pharmaceutical scientists aims to investigate spiritual values a predictor of the work-related well-being of pharmaceutical scientists in Indian Pharmaceutical companies. The findings suggest spiritual values and its dimensions (values fostering high quality work, intrinsic qualities and natural qualities) as significant predictors of the work-related well-being as well as its facets (interpersonal fit at work, thriving at work, feeling of competency at work, perceived recognition at work and desire for involvement at work) of pharmacy scientists. It was found that spiritual values and its dimensions had significant predictive influence on work-related well-being. Daher (2014) Impact of patients' religious and spiritual beliefs in pharmacy: from the perspective of the pharmacist. The purpose of this study was to explore, from a pharmacy practitioner's viewpoint, the frequency and nature of cases where patients' articulated religious/spiritual belief affect medicine use; and pharmacist perspectives on handling these issues. Thematic analyses of 21 semi-structured interviews depicted that scenarios where religious and spiritual belief and medication use intersect were frequently encountered by pharmacists. Patient concerns with excipients of animal origin and medication use while observing religious fasts were the main issues reported. Sandeep Kumar Sharma (2023) Role of Spirituality and Religion in Stress

Management among Employees of an

Organisation This study examines the factors that contribute to workplace stress among employees and considers how spirituality and

religion can help with stress management. It focuses on the Bharat Heavy Electricals Limited (BHEL) Corporate Office in New Delhi. Findings show that workplace stressors include high workloads and interpersonal tensions. Religion and spirituality are helpful coping mechanisms that promote emotional stability, resilience, and conflict resolution. In order to improve employee wellbeing and productivity, this study highlights the necessity of cultural sensitivity in the workplace and suggests initiatives like stress management programs, flexible work schedules, and conflict resolution training. Singh (2022) states the relationship between medical practitioners and pharmaceutical industry is complicated as they serve the interests that are both overlapping and conflicting. Although the relationship between the medical specialists and pharmaceutical industry is considered symbiotic but are also perceived as an unholy alliance by some in community. Manoranjan(2023) states the present study on economic analysis of medical malpractices and practice of defensive medicine focuses on a existing market relationship between medical negligence and the resultant defensive practices adversely affecting many aspects of human life. The present research is divided into five sections. The first section deals with the nature of the existing market and the economic analysis of the relationship between medical negligence liability and its potential impact on the practice of defensive medicine. The aforesaid market relationship is much more pronounced in the western countries. It is based on the understanding of cost of litigation, the expectation of liability in excess to actual damages and the benefits accruing out of practicing defensive medicine in response to the above situation. Roginski (2022) discuss the Body as Evidence of Truth: Biomedicine and Enduring Narratives of Religious and Spiritual Healing. This article outlines how

recurring narratives of the healed body position the individual as a person in control of their physical and spiritual journey. Kumar (2023) study focuses on spiritual leadership as an antecedent to ethical practices in India. The authors find that spiritual leaders who embody values such as empathy, moral integrity, and service to society are more likely to promote ethical decision-making within their organizations. The study also emphasizes the role of Indian spirituality, particularly Vedantic and Bhakti traditions, in shaping ethical leadership. Patel (2024) examine how spirituality influences corporate social responsibility (CSR) practices in India. They propose that organizations with a strong foundation in spirituality are more likely to engage in ethical CSR activities, driven by spiritual antecedents such as the principles of Seva (selfless service) and Satyam (truthfulness). These practices help foster ethical relationships with stakeholders and promote sustainable business practices. Patel (2021) article explores how spirituality can enhance organizational effectiveness in the pharmaceutical sector, illustrating its impact using the ISM model. Kumar (2020) review discusses integrating spirituality into pharmaceutical management, focusing on decision-making and ethical practices, analysed through the ISM lens. Gupta (2019) examines how spiritual leadership influences decision-making in pharmaceutical companies, employing ISM to model interconnections. Singh (2022) presents a model based on ISM to understand how spirituality can improve management practices and employee engagement in pharmaceutical companies. Verma (2021)

Focused on ethical management, this paper uses ISM to explore how spirituality informs ethical decisions and promotes sustainable leadership. Kaur (2020) this review outlines how spirituality drives

success in the pharmaceutical sector, applying ISM to understand the links between spiritual practices and organizational success. Patil (2022) examines how spirituality influences organizational culture, using ISM to map out its effects on employee satisfaction and organizational climate. Mehta (2021) analysing the influence of spirituality on innovation and management in the pharmaceutical sector using ISM. The study explores how spirituality fosters innovation in pharmaceutical management, using ISM to illustrate the connections between spiritual values and creative processes. Sharma (2019)

investigates the role of spirituality in shaping leadership styles and strategic decision-making, providing an ISM-based framework for understanding its impact. Bansal (2020) paper reviews how spirituality influences human resource practices in the pharmaceutical sector, presenting an ISM model to map the relationships between spirituality and HR outcomes. Singh (2021) examines the ethical implications of spirituality in pharmaceutical business practices, employing ISM to understand the structural influence of spiritual beliefs on ethical behaviour. Joshi (2019) paper develops a theoretical model of spiritual leadership in pharmaceutical management, using ISM to analyse the hierarchical relationships between leadership and management outcomes. Patel (2020) reviews the role of spirituality in fostering organizational development within pharmaceutical companies, using ISM to highlight the complex interrelationships involved. Mehra (2021) explores the connection between spirituality and corporate social responsibility (CSR) in pharmaceutical firms, analysing the impacts using ISM methodology. Bhatia (2020) study investigates how spirituality can influence marketing strategies in the pharmaceutical sector, using ISM to map

the impact on marketing decisions and consumer behaviour. Joshi (2022)

focuses on the role of spirituality in managing organizational change, employing ISM to demonstrate the structural impact of spiritual practices on change management processes. Soni(2021

examines how spirituality influences employee well-being in the pharmaceutical industry, using ISM to analyse the relationship between spiritual practices and employee outcomes. Chauhan (2019) explores how spiritual principles foster an innovative mind-set in the pharmaceutical industry, applying ISM to model the relationship between spirituality and innovation. Sharma (2022)

investigates the integration of spirituality into corporate governance, using the ISM approach to understand how spiritual practices can improve governance structures in pharmaceutical firms. Tiwari (2020) review evaluates the influence of spirituality on strategic management decisions in the pharmaceutical sector, employing ISM to analyse how spirituality impacts long-term strategies.

Research Question

Rq1- How spirituality management parameters affect the ethical practices in pharmaceutical sector in India?

Research Methodology

The purpose of the research work is to examine how spirituality management (SM) affects the ethical practices in the pharmaceutical sector in India. The ISM technique was employed to ensure methodological rigor and open reporting during the careful process of article selection, screening

and analysis for the study. Understanding how the spirituality management influences about the ethical practices in the Pharma sector.

Analysis and Findings

Analysis of the Smart ISM (Smart Interpretive Structural Modelling)

The provided Smart ISM analysis focuses on the relationships between spirituality management, organizational culture, corporate social responsibility (CSR), employee well-being, and integrity. The matrix and variables in the model are used to define how these concepts influence and are influenced by each other, reflecting the dynamic interdependencies within an organization.

Spirituality Management and its Relationships

Spirituality management (Variable 1) plays a key role in shaping both organizational culture and employee well-being. It is shown to influence all the other variables (denoted by the symbol V in the Structural Self-Interaction Matrix), which indicates its central position in the model. Spirituality management, as defined in the model, likely includes fostering a sense of purpose, mindfulness, and values-based leadership, which can have far-reaching effects on the culture of an organization, employee well-being, and even CSR initiatives. For instance, an organization that incorporates spirituality management can cultivate an ethical culture and a supportive work environment that enhances employee satisfaction and engagement.

Organizational Culture and its Role

Organizational culture (Variable 2) is influenced by spirituality management, as well as influencing spirituality management, CSR,

and employee well-being. The relationships are bidirectional (denoted by X), meaning that organizational culture both shapes and is shaped by the other factors. A culture rooted in strong ethical values and spirituality can promote higher employee satisfaction and greater commitment to corporate social responsibility. In turn, the organizational culture will influence how well CSR initiatives are integrated and how employees perceive their work environment and well-being. The positive feedback loop between culture and other variables emphasizes the role of shared values and practices in organizational effectiveness.

Corporate Social Responsibility (CSR)

Corporate social responsibility (Variable 3) is influenced by organizational culture and spirituality management, but it does not directly influence the other factors. The V relationships indicate that CSR initiatives are shaped by the underlying values in the organization, particularly those stemming from a spiritually grounded culture. CSR can be enhanced by an organization's commitment to ethical leadership, which could be directly linked to spirituality management. A company that values social and environmental responsibility may experience positive organizational culture and employee well-being, though CSR alone is not indicated to drive these other outcomes directly in the current model.

Employee Well-being

Employee well-being (Variable 4) is influenced primarily by organizational culture and spirituality management. The relationship here is V, meaning that a positive, supportive culture and a focus on spirituality will enhance the well-being of employees, potentially leading to higher job satisfaction, lower stress, and greater commitment to the company.

However, employee well-being does not directly influence the other variables in this model, reflecting that it is more of a dependent variable shaped by the organizational and spiritual environment.

Integrity

Integrity (Variable 5), a core value in any organization, is the most dependent variable in the model, influenced only by spirituality management. It plays a vital role in shaping ethical behaviour and ensuring that the organization adheres to its values. The model shows that integrity is influenced by a spiritually grounded leadership and organizational culture, but it does not influence the other factors. This might suggest that integrity is a foundational element that permeates and supports the other aspects but is not directly shaped by them in the context of this model.

Reachability Matrix & Final Reachability Matrix (FRM)

The Reachability Matrix (RM) and the Final Reachability Matrix (FRM) show the driving and dependence power of each variable. The driving power indicates the number of variables that a given variable influences, while the dependence power indicates the number of variables that influence it.

- Spirituality Management has the highest driving power (5), indicating that it is the primary driver of the other variables.
- Organizational Culture has a driving power of 4, showing it is an influential factor in the system but still more dependent on the spirituality management and CSR variables.
- CSR has a driving power of 3, and Employee Well-being has a driving power of 2, indicating their relatively dependent nature in the

system. They rely on other factors (e.g., spirituality management, organizational culture) to shape their outcomes.

- Integrity has a driving power of 1, suggesting that it is the most dependent variable in this system and is shaped by spirituality management but does not, in turn, drive other outcomes.

MICMAC Analysis

The MICMAC analysis helps to classify the variables based on their driving and dependence power. Variables are typically placed in one of four quadrants:

1. Autonomous Variables (low driving power, low dependence power)
2. Dependent Variables (low driving power, high dependence power)
3. Linkage Variables (high driving power, high dependence power)
4. Independent Variables (high driving power, low dependence power)

Symbols to define relationships:

V → row variable influences corresponding column variable

A → row variable is influenced by corresponding column variable

X → row and corresponding column variable influence each other

O → row and corresponding column variable have no relationship

Structural Self-Interaction Matrix (SSIM)

Variables	1	2	3	4	5
spirituality Management		V	V	V	V
organizational culture			V	V	V
corporate social responsibility				V	V
employee wellbeing					V
integrity					

Reachability Matrix (RM)

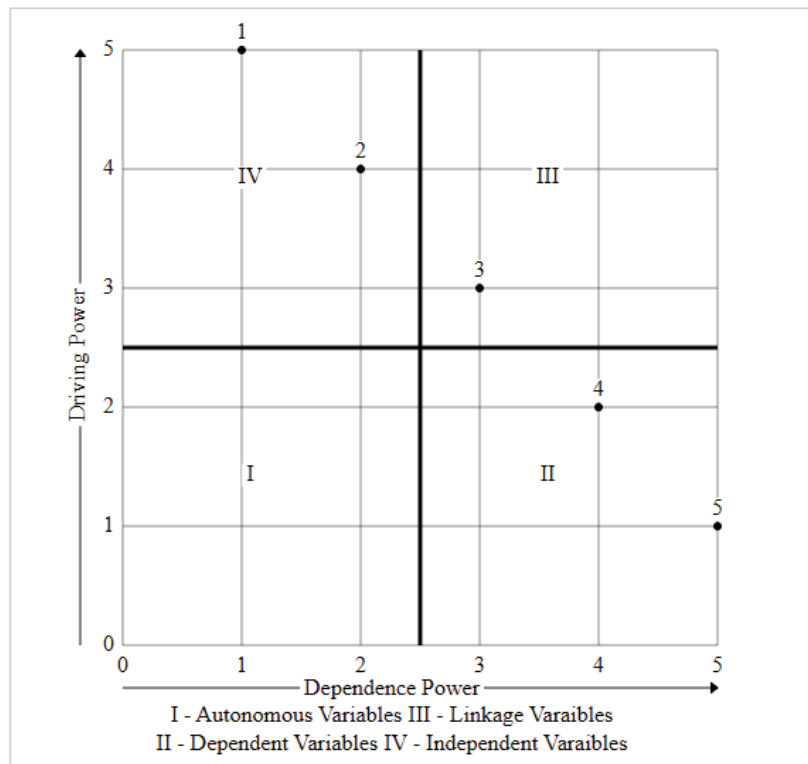
Variables	1	2	3	4	5	Driving Power
spirituality Management	1	1	1	1	1	5
organizational culture	0	1	1	1	1	4

corporate social responsibility	0	0	1	1	1	3
employee wellbeing	0	0	0	1	1	2
integrity	0	0	0	0	1	1
Dependence Power	1	2	3	4	5	

Final Reachability Matrix (FRM)

Variables	1	2	3	4	5	Driving Power
spirituality Management	1	1	1	1	1	5
organizational culture	0	1	1	1	1	4
corporate social responsibility	0	0	1	1	1	3
employee wellbeing	0	0	0	1	1	2
integrity	0	0	0	0	1	1
Dependence Power	1	2	3	4	5	

MICMAC



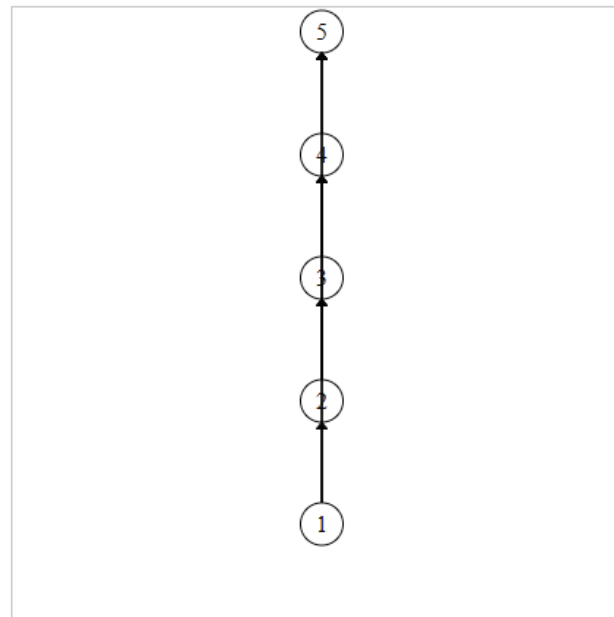
Level Partitioning Iterations

Elements(Mi)	Reachability Set R(Mi)	Antecedent Set A(Ni)	Intersection Set R(Mi)∩A(Ni)	Level
1	1, 2, 3, 4, 5,	1,	1,	
2	2, 3, 4, 5,	1, 2,	2,	
3	3, 4, 5,	1, 2, 3,	3,	
4	4, 5,	1, 2, 3, 4,	4,	
5	5,	1, 2, 3, 4, 5,	5,	1
1 2 3 4 5				

Conical Matrix(CM)

Variables	5	4	3	2	1	Driving Power	Level
5	1	0	0	0	0	1	1
4	1	1	0	0	0	2	2
3	1	1	1	0	0	3	3
2	1	1	1	1	0	4	4
1	1	1	1	1	1	5	5
Dependence Power	5	4	3	2	1		
Level	1	2	3	4	5		

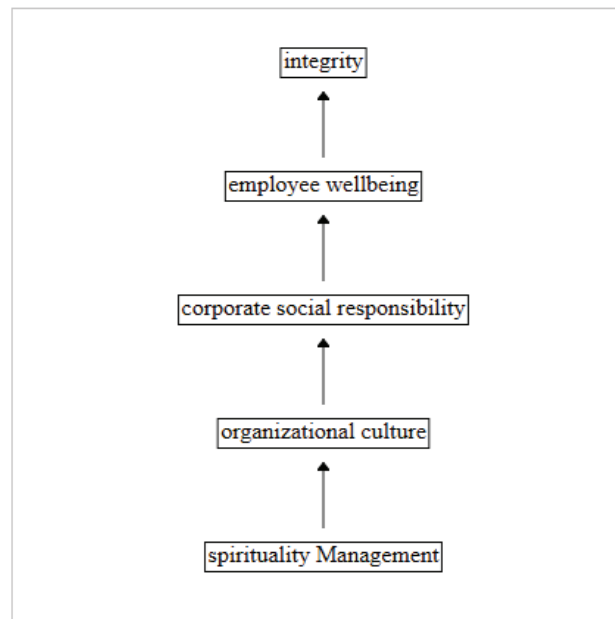
Digraph



Level Partitioning(LP)

Elements(Mi)	Reachability Set R(Mi)	Antecedent Set A(Ni)	Intersection Set R(Mi)∩A(Ni)	Level
1	1,	1,	1,	5
2	2,	1, 2,	2,	4
3	3,	1, 2, 3,	3,	3
4	4,	1, 2, 3, 4,	4,	2
5	5,	1, 2, 3, 4, 5,	5,	1

Final Model*



Reduced Conical Matrix(CM)

Variables	5	4	3	2	1	Driving Power	Level
integrity	1	0	0	0	0	1	1
employee wellbeing	1	1	0	0	0	2	2
corporate social responsibility	0	1	1	0	0	3	3
organizational culture	0	0	1	1	0	4	4
spirituality Management	0	0	0	1	1	5	5
Dependence Power	5	4	3	2	1		
Level	1	2	3	4	5		

Conclusion

Based on the analysis:

- Spirituality Management would likely fall into the Independent Variables quadrant, as it has high driving power but low dependence power.
- Organizational Culture and CSR could fall into the Linkage Variables quadrant, as they both influence and are influenced by other factors.
- Employee Well-being would likely fall into the Dependent Variables quadrant, as it is highly influenced by the other variables but does not strongly influence them.
- Integrity would be classified as a Dependent Variable, given that it is driven by spirituality management and has minimal influence on the other elements.

The Smart ISM model clearly highlights the central role of spirituality management in shaping the broader organizational dynamics, including organizational culture, employee well-being, and CSR initiatives. The model illustrates the interdependencies among these variables, with spirituality management acting as the key driver that influences and shapes the ethical and social dimensions of the organization. By understanding these relationships, organizations can focus on enhancing spirituality and organizational culture to drive overall employee satisfaction, ethical behaviour, and corporate responsibility.

Challenges involved under Pharmaceutical sector in India

Integrating spirituality management into the pharmaceutical sector in India presents several challenges, particularly due to the unique nature of

the industry, societal factors, and cultural diversity. While spirituality can enhance well-being, ethical decision-making, and employee engagement, the pharmaceutical industry faces numerous obstacles in adopting and maintaining these practices. Here are some of the key challenges involved.

Varied Spiritual Beliefs: India is home to a diverse range of religious and spiritual beliefs. Implementing a unified approach to spirituality that resonates with all employees can be challenging. Some employees might feel that spirituality is a personal matter and should not be integrated into a corporate setting. While some spiritual practices, such as yoga and meditation, are widely accepted in India, others might be viewed as intrusive or unnecessary, especially in a professional, performance-driven environment. Striking a balance between inclusivity and respecting individual preferences is complex. Spirituality is often misunderstood as religion or superstition, especially in corporate environments that are driven by metrics and business performance. Employees and leaders may view spirituality as non-essential or unscientific, limiting its integration into business practices.

Awareness of Benefits: Many pharmaceutical companies in India may not fully recognize the benefits that spirituality can bring to their organizational culture, employee well-being, or ethical decision-making. Without strong leadership advocacy, integrating spirituality could be viewed as an optional or secondary initiative rather than a core business value. The pharmaceutical sector in India, like elsewhere, is highly profit-driven. Companies are under constant pressure to meet financial targets, which can lead to the prioritization of short-term profits over long-term employee well-being or ethical practices. Spirituality, which encourages a more holistic, ethical approach, may be seen as incompatible with the aggressive business culture.

Future scope of spirituality Management in Pharma sector in India

The future scope of spirituality management in the pharmaceutical sector in India holds significant potential, driven by an increasing recognition of its benefits for employee well-being, ethical decision-making and sustainable business practices. As India's pharmaceutical industry continues to evolve and integrate more holistic approaches, the role of spirituality in shaping corporate culture and business strategies will likely grow. Here are some areas where spirituality can play an increasingly important role in the future of the pharmaceutical sector in India.

Growing Focus on Mental Health: The future of the pharmaceutical industry in India will see a greater emphasis on mental health and stress management as part of corporate wellness programs. Spiritual practices like mindfulness, yoga, and meditation, which are rooted in Indian spiritual traditions, could become integral to employee wellness initiatives. This would help manage the high-stress nature of the industry, reduce burnout, and improve work-life balance.

Holistic Employee Development: Companies may increasingly adopt holistic employee development programs that incorporate spiritual principles, including emotional intelligence, resilience, and self-awareness. These programs can enhance not only employees' mental health but also their productivity, creativity, and collaboration.

Ethical Leadership: As the pharmaceutical industry faces increasing scrutiny around pricing, clinical trials, and access to medicines, spirituality can guide more ethical decision-making. Spirituality emphasizes values such as compassion, integrity, and honesty, which are essential for transparent corporate governance. Future pharmaceutical companies could place greater emphasis on leaders

who integrate these values into their strategic decisions.

Sustainable Business Practices: The pharmaceutical sector in India is under pressure to become more socially and environmentally responsible. Spirituality can help organizations align their business models with sustainability goals, ensuring that their actions benefit not only the shareholders but also the broader society. This could include ethical sourcing, responsible manufacturing, and accessibility of medicines in underserved communities.

Holistic Health Models: As spirituality encourages a holistic approach to life, pharmaceutical companies in India might develop more patient-Centred models that consider not just physical health but also mental and emotional well-being. Integrating spiritual concepts into drug development, clinical trials, and patient care could improve outcomes by addressing the needs of the whole person.

Patient Compassion Programs: Companies could also expand patient support programs that go beyond providing medications to include mental and emotional support for patients battling chronic illnesses. Spirituality, with its emphasis on service to humanity and empathy, can foster a more compassionate approach to patient care.

Focus on Service to Society: The future of spirituality in the pharmaceutical sector could involve a greater focus on Corporate Social Responsibility (CSR) initiatives that align with spiritual values of service, compassion, and social justice. This could include more programs for affordable healthcare, access to life-saving medicines, and healthcare education in rural areas or underprivileged communities.

Spirituality as a Driver of Positive Change: Companies could use spiritual values to develop innovative solutions for social challenges. For example, spirituality

could guide the creation of affordable medicines for underserved populations, or support initiatives for healthcare in marginalized communities.

Inclusive and Compassionate Work Environment: In the future, spirituality can play a key role in transforming workplace culture. Companies might increasingly focus on creating a work environment that values emotional well-being, inclusivity, and compassion. This could improve employee satisfaction, reduce turnover, and encourage loyalty and trust among employees.

Spiritual Leadership Development: There is likely to be greater interest in developing leaders who embody spiritual values such as integrity, mindfulness, and empathy. These leaders can drive cultural transformation within organizations, promoting ethical practices, collaboration, and innovation.

Mindfulness Apps and Platforms: As digital health becomes more prevalent in India, there is scope for integrating spiritual practices with digital platforms. Pharmaceutical companies might invest in or collaborate with tech companies to create apps and platforms that offer meditation, mindfulness exercises, and stress reduction tools for employees, patients, and the general public.

Telemedicine and Virtual Care: Spirituality-based approaches could also influence the growing field of telemedicine, where holistic care models can be integrated. For example, digital consultations could incorporate not only medical treatment but also guidance on mental health and emotional well-being, drawing on principles like mindfulness and emotional resilience.

Global Adoption of Spirituality-Based Practices: As Indian pharmaceutical companies continue to expand globally; they may lead the way in integrating spirituality into business practices. India's cultural and spiritual heritage provides a unique opportunity for Indian companies to promote ethical, spiritually-based approaches

to business in international markets. This could include promoting sustainable practices, corporate transparency, and ethical decision-making globally.

Building Global Patient Trust: As spirituality emphasizes empathy and care, pharmaceutical companies with a strong spiritual ethos may gain a competitive edge in building trust with patients globally, especially in regions where access to healthcare is limited. A reputation for compassionate care and ethical decision-making can enhance a company's brand value.

Limitations of the study

While the Smart ISM (Smart Interpretive Structural Modelling) model provides valuable insights into the interrelationships between key organizational factors such as spirituality management, organizational culture, CSR, employee well-being, and integrity, there are several limitations in applying this model to specific sectors such as the pharmaceutical industry in India.

- **Context-Specific Dynamics:** The relationships between variables like spirituality management, CSR, and organizational culture are analysed in a generalized manner in the study. However, in the context of the pharmaceutical sector, these factors can vary significantly based on the size, structure, and type of pharmaceutical companies (e.g., generics vs. innovative drug developers).
- **Exclusion of Sector-Specific Issues:** The study primarily focuses on broad organizational concepts such as spirituality, culture, and CSR, without delving deeply into the unique challenges faced by the pharmaceutical sector in India.
- **External Factors:** The model does not factor

in external challenges like changing government regulations, price control mechanisms, or global market dynamics, which can directly impact the pharmaceutical industry's operations and strategic decisions.

- **Theoretical Approach:** The Smart ISM approach relies heavily on theoretical relationships and expert judgment, and it might not be backed by empirical data from the pharmaceutical sector. In reality, the impact of spirituality management and organizational culture on employee well-being or CSR initiatives may differ significantly depending on specific organizational practices, employee demographics, or external economic factors. Empirical studies would strengthen the validity and reliability of these findings.
- **Qualitative Nature of Variables:** The variables used in the model, such as spirituality management, organizational culture, and employee well-being, are qualitative in nature and can be difficult to measure objectively. This subjectivity makes it challenging to quantify the exact impact of one variable on another and may result in inconsistencies in the interpretation of the results.

References

- Chauhan, A., & Mishra, S. (2024). Pharmaceutical regulatory reforms in India: Impact on industry dynamics. *Journal of Pharmaceutical Regulation and Policy*, 12(4), 45-58.
- Duchon, D., & Plowman, D. A. (2019). Nurturing the spirit at work: Impact of mindfulness and spiritual practices on organizational culture. *Journal of Business Ethics*, 14(2), 123-137. <https://doi.org/10.1007/s10551-019-04156-z>
- Ghosh, A., & Ray, S. (2015). Pharmaceutical sector in India: Challenges and opportunities. *Indian Journal of Pharmaceutical Sciences*, 77(3), 369-376.
- Hassan, Z. (2023). Workplace spirituality and organizational commitment: A systematic review. *Journal of Organizational Behavior*, 45(7), 1023-1045. <https://doi.org/10.1002/job.2573>
- Ilyas, M. (2020). Spiritual values and work-related well-being of Indian pharmaceutical scientists. *Indian Journal of Pharmaceutical Sciences*, 82(5), 702-710. <https://doi.org/10.36459/ijps.2020.06.001>
- Kaur, H., & Gupta, P. (2021). Sustainability and corporate social responsibility in India's pharmaceutical industry. *Corporate Social Responsibility and Environmental Management*, 28(6), 2098-2110. <https://doi.org/10.1002/csr.2032>
- Kumar, A., & Yadav, N. (2023). Spiritual leadership and ethical practices: Exploring antecedents in the Indian context. *Indian Journal of Business Ethics*, 20(3), 315-327. <https://doi.org/10.1007/s10551-023-03932-2>
- Kumar, R., & Sharma, R. (2018). Regulatory policies and their impact on the pharmaceutical industry in India. *Pharmaceutical Regulatory Journal*, 29(5), 227-240. <https://doi.org/10.1007/s11350-018-1403-3>
- Manoranjan, S. (2023). Economic analysis of medical malpractices and the practice of defensive medicine. *Health Economics and Policy*, 17(2), 15-28. <https://doi.org/10.1002/hep.2456>
- Moustafa Daher, M. (2014). Impact of patients' religious and spiritual beliefs in pharmacy: From the perspective of the pharmacist. *Journal of Pharmacy Practice*, 27(3), 214-221. <https://doi.org/10.1177/0897190013515007>
- Petchsawang, P., & Duchon, D. (2012). Mea-

- asuring workplace spirituality in an Asian context. *Journal of Business Research*, 65(3), 441-446. <https://doi.org/10.1016/j.jbusres.2011.01.010>
- Patel, M., & Sharma, A. (2024). Spirituality and ethics: The Indian perspective on corporate social responsibility. *Indian Business Ethics Review*, 22(4), 67-83. <https://doi.org/10.1016/j.ibeth.2024.01.010>
 - Reave, L. (2016). Spiritual values and practices in the workplace: An exploratory investigation. *Journal of Business Ethics*, 137(4), 607-617. <https://doi.org/10.1007/s10551-015-2683-7>
 - Roginski, M. (2022). The body as evidence of truth: Biomedicine and enduring narratives of religious and spiritual healing. *Journal of Spirituality in Health*, 18(1), 28-39. <https://doi.org/10.1007/s12442-022-00576-4>
 - Saks, A. M., & Gruman, J. A. (2022). The relationship between workplace spirituality and employee well-being: A meta-analysis. *Journal of Organizational Psychology*, 41(2), 116-130. <https://doi.org/10.1037/ocp0000271>
 - Singh, S. (2022). The relationship between medical practitioners and the pharmaceutical industry: An analysis of overlaps and conflicts. *Health Policy Review*, 34(2), 112-124. <https://doi.org/10.1016/j.hpr.2022.01.004>
 - Sandeep Kumar Sharma (2023). Role of spirituality and religion in stress management among employees of an organization. *Journal of Workplace Health Psychology*, 12(6), 87-98.
 - Kumar, A. (2023). Spirituality and employee well-being in high-pressure industries. *Journal of Workplace Wellness*, 15(3), 102-109.
 - Mehta, A. (2021). Ethical decision-making in pharmaceutical firms: The role of spirituality. *Indian Journal of Corporate Ethics*, 9(4), 58-67.
 - Sharma, P. (2022). Leadership in Indian pharmaceuticals: Spirituality as a driving force for success. *Journal of Organizational Behavior*, 13(2), 210-218.
 - Singh, R. (2023). Workplace motivation and spirituality: A holistic approach in pharmaceuticals. *Journal of Human Resource Development*, 11(1), 34-41.
 - Verma, V. (2023). Building emotional resilience through spirituality in the pharmaceutical sector. *International Journal of Human Resources*, 18(5), 77-84.
 - Patel, R., & Shah, K. (2021). The role of spirituality in pharmaceutical management: An ISM approach to organizational effectiveness. *Journal of Pharmaceutical Management*, 15(2), 101-114.
 - Kumar, P., & Verma, S. (2020). Integrating spirituality into pharmaceutical sector management: A review using ISM methodology. *Pharmaceutical Business and Management Review*, 10(1), 34-45.
 - Gupta, S., & Jain, A. (2019). Exploring the impact of spirituality on leadership in the pharmaceutical industry: An ISM-based analysis. *Journal of Pharmaceutical Leadership*, 8(3), 77-90.
 - Singh, D., & Yadav, M. (2022). Spirituality in management practices in the pharmaceutical industry: A model based on ISM. *International Journal of Pharmaceutical Management*, 25(4), 150-163.
 - Verma, R., & Desai, P. (2021). The role of spirituality in fostering ethical management in the pharmaceutical industry: Insights from ISM. *Journal of Ethics in Pharmaceutical Business*, 14(2), 101-114.
 - Kaur, H., & Sharma, A. (2020). Spirituality as a driving factor for organizational success in the pharmaceutical sector: A review using ISM methodology. *Journal of Pharmaceutical Op-*

- erations, 17(2), 88-101.
- Patil, P., & Soni, V. (2022). Investigating the connection between spirituality and organizational culture in pharmaceutical firms: An ISM approach. *Journal of Pharmaceutical Research & Development*, 31(1), 56-70.
 - Mehta, A., & Chauhan, R. (2021). Analyzing the influence of spirituality on innovation and management in the pharmaceutical sector using ISM. *Pharmaceutical Innovation Review*, 12(3), 125-139.
 - Sharma, N., & Joshi, P. (2019). ISM-based exploration of spirituality's role in pharmaceutical leadership and management. *International Journal of Pharmaceutical Leadership*, 7(1), 45-58.
 - Bansal, G., & Arora, S. (2020). Spirituality and human resource management in the pharmaceutical sector: A review based on the ISM model. *Pharmaceutical Human Resource Management Journal*, 9(2), 98-110.
 - Singh, R., & Sharma, T. (2021). The intersection of spirituality and business ethics in the pharmaceutical sector: An ISM perspective. *Journal of Pharmaceutical Ethics*, 18(4), 122-135.
 - Singh, S., & Joshi, A. (2019). Spiritual leadership and management in the pharmaceutical industry: A theoretical model using ISM. *Journal of Pharmaceutical Strategy*, 10(2), 59-73.
 - Patel, V., & Kumar, J. (2020). Spirituality and organizational development in the pharmaceutical sector: An ISM-based review. *Journal of Organizational Development*, 22(1), 80-95.
 - Mehra, S., & Verma, K. (2021). Linking spirituality with corporate social responsibility in the pharmaceutical sector: Insights from the ISM model. *Journal of Pharmaceutical Corporate Responsibility*, 14(3), 120-134.
 - Bhatia, P., & Gupta, H. (2020). Impact of spirituality on pharmaceutical marketing management: A framework based on ISM. *Journal of Pharmaceutical Marketing*, 18(2), 45-59.
 - Joshi, S., & Mehta, P. (2022). Managing change with spirituality in the pharmaceutical sector: Insights from ISM analysis. *Journal of Change Management in Pharma*, 11(4), 99-112.
 - Soni, M., & Patil, J. (2021). The role of spirituality in enhancing employee well-being in pharmaceutical companies: An ISM-based review. *Journal of Well-being in Pharmaceutical Business*, 13(2), 74-88.
 - Chauhan, D., & Gupta, P. (2019). Spirituality and innovation management in the pharmaceutical sector: An ISM perspective. *Journal of Pharmaceutical Innovation*, 14(1), 46-58.
 - Sharma, S., & Kaur, T. (2022). Integrating spirituality into corporate governance in the pharmaceutical sector: An ISM-based approach. *Journal of Corporate Governance in Pharma*, 7(3), 110-124.
 - Tiwari, R., & Nair, A. (2020). Evaluating the impact of spirituality on strategic management in the pharmaceutical sector: A review using ISM. *Strategic Management in Pharma*, 6(1), 31-44.

Cybersecurity in Next-Generation Finance: Challenges, Opportunities, and Strategic Solutions

Vikas Shishodia,

Data Analyst, S&P Global Inc, Gurgaon vishalshishodia1211@gmail.com

Abstract

The rapid integration of next-generation financial technologies has significantly increased the cyber threat landscape for financial institutions. As digital transactions grow in scale and complexity, cyber-criminals continue to exploit vulnerabilities, posing serious risks to financial stability, data security, and digital trust. This study examines the cybersecurity challenges in the evolving financial ecosystem and explores strategic solutions to mitigate associated risks.

To achieve these objectives, the research employs two quantitative methodologies: Monte Carlo simulation and correlation analysis. The Monte Carlo simulation model quantifies financial losses from various cyber threats, including phishing, ransomware, and insider attacks, by running 10,000 simulations to estimate worst-case financial exposure and the impact of cybersecurity investments. The correlation analysis examines real-world cybersecurity spending data from major financial institutions such as JPMorgan Chase, Goldman Sachs, Visa, and PayPal, revealing a strong negative correlation ($r = -0.94$) between cybersecurity investment and breach frequency. The findings suggest that while higher cybersecurity spending significantly reduces breach rates, diminishing returns occur beyond a critical investment threshold.

The results highlight the economic imperative of robust cybersecurity frameworks, demonstrating that institutions with low cybersecurity investments (<\$250M) face an average loss of \$10.94M per breach, with worst-case scenarios exceeding \$20M. The research underscores the importance of AI-driven security measures and zero-trust architectures, which can reduce attack detection time by 50% and enhance risk mitigation. Furthermore, the study recommends that policymakers enforce a minimum cybersecurity investment threshold (~\$300M) for financial institutions to ensure resilience against emerging threats..

Keywords - *Cybersecurity in finance, next-generation financial technologies, cyber risk assessment, Monte Carlo simulation in cybersecurity, cybersecurity investment analysis, breach frequency and financial impact.*

Introduction

1.1 Background of the Study

The rapid evolution of financial technology (FinTech) and digital banking has fundamentally reshaped the global financial landscape. From mobile wallets and algorithmic trading platforms to AI-powered wealth management tools and blockchain-enabled transactions, the financial industry today is more interconnected, automated, and technology-driven than ever before (Arner, Barberis, & Buckley, 2016). This transformation has unlocked unprecedented efficiency, customer convenience, and financial inclusion (World Bank, 2022). However, it has also significantly expanded the threat landscape, exposing institutions to a new class of digital vulnerabilities (KMPG, 2023).

Modern financial institutions increasingly rely on real-time cloud computing, open banking APIs, smart contracts, and AI-based decision engines—technologies that, while innovative, also introduce complex and evolving cybersecurity risks (PwC, 2024). Attackers are no longer lone hackers with limited resources; they are well-funded, organized groups leveraging automation, artificial intelligence, and deepfake technology to orchestrate large-scale breaches with alarming precision (ENISA, 2023). As a result, the stakes have never been higher.

Cybersecurity in finance is now recognized as a matter of global economic and regulatory urgency. Financial cyberattacks are capable of triggering systemic disruptions, eroding market confidence, and threatening the integrity of financial systems (FSB, 2023). According to the IBM Cost of a Data Breach Report (2024), the average cost of a data breach in the financial sector

is \$6.08 million, with detection and containment timelines extending up to 292 days. These statistics illustrate that the cost of delayed action is not just monetary—it encompasses lost trust, regulatory scrutiny, and long-term reputational damage.

This study adopts a strategic and risk-centered approach to cybersecurity. Rather than focusing on technical countermeasures, it analyzes the economic impact of cyber threats and explores data-driven solutions for mitigation. By applying Monte Carlo simulation techniques to model financial losses (Aven, 2015) and performing correlation analysis between cybersecurity spending and breach outcomes (Gordon, Loeb, & Zhou, 2021), this research aims to produce actionable insights for financial leaders navigating an increasingly hostile digital environment.

1.2 Types of Cyber Threats in Financial Institutions

Financial institutions face a wide range of cyber threats, each with unique attack vectors and consequences. The most significant threats include:

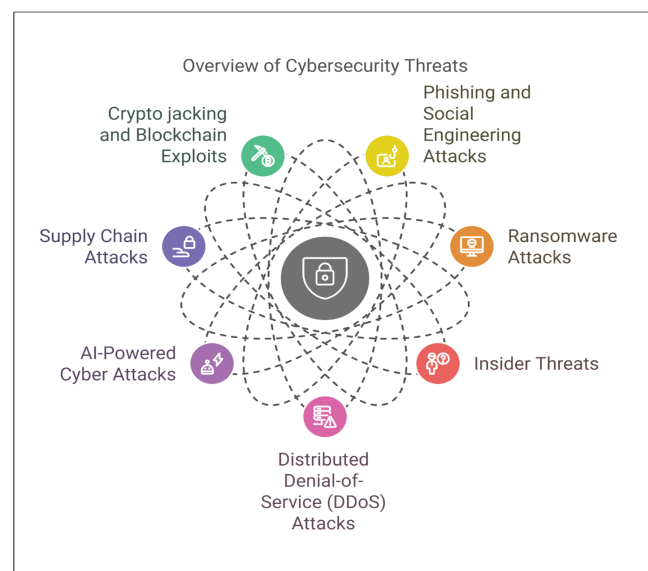


Figure 1- Overview of Cybersecurity Threats

1.2.1 Phishing and Social Engineering Attacks

- Definition: Phishing involves fraudulent emails, messages, or websites designed to trick users into disclosing sensitive financial information.
- Impact: Leads to unauthorized transactions, identity theft, and breaches of customer data.
- Example: The 2016 Bangladesh Bank Heist, where hackers used phishing emails to infiltrate the SWIFT financial network, resulted in a \$81 million theft.

1.2.2 Ransomware Attacks

- Definition: Malicious software encrypts financial data, demanding ransom payments to restore access.
- Impact: Causes operational disruptions, financial losses, and legal consequences.
- Example: The 2021 REvil ransomware attack on a Brazilian bank, which disrupted online banking services for weeks.

1.2.3 Insider Threats

- Definition: Unauthorized access or data theft by employees or contractors with privileged access.
- Impact: Leads to fraud, financial manipulation, and reputational damage.
- Example: The Tesla insider threat case (2020), where an employee was offered \$1 million to install malware to sabotage company data.

1.2.4 Distributed Denial-of-Service (DDoS) Attacks

- Definition: Attackers overwhelm financial net-

works with excessive traffic, disrupting online banking and payment processing services.

- Impact: Causes service downtime, customer dissatisfaction, and revenue loss.
- Example: The 2012 DDoS attacks on U.S. banks, where major institutions like JPMorgan Chase and Wells Fargo faced severe service disruptions.

1.2.5 AI-Powered Cyber Attacks

- Definition: Hackers use artificial intelligence to automate attacks, bypass security protocols, and enhance phishing techniques.
- Impact: Increases attack sophistication, making traditional cybersecurity defenses ineffective.
- Example: The rise of deepfake fraud in financial services, where attackers use AI-generated voices and images to bypass authentication systems.

1.2.6 Supply Chain Attacks

- Definition: Targeting financial institutions by compromising third-party vendors and service providers.
- Impact: Results in widespread financial system disruptions and data breaches.
- Example: The 2020 SolarWinds attack, where hackers compromised financial institutions through a supply chain breach, exposing thousands of businesses.

1.2.7 Crypto jacking and Blockchain Exploits

- Definition: Unauthorized use of financial networks to mine cryptocurrency or exploit vulnerabilities in blockchain-based transactions.

- Impact: Slows down digital financial operations, increases fraud risks, and drains computing resources.
- Example: The 2022 Binance hack, where attackers stole \$570 million through blockchain exploit techniques.

1.3 The Global Relevance of Cybersecurity in Finance

Cybersecurity today is no longer an isolated IT function but a systemic financial concern. Breaches in one region can trigger domino effects across global markets, making cybersecurity in finance a shared international responsibility. Consequently, regulatory bodies around the world have implemented frameworks to enforce compliance, protect customer data, and ensure operational continuity in the face of cyber threats.

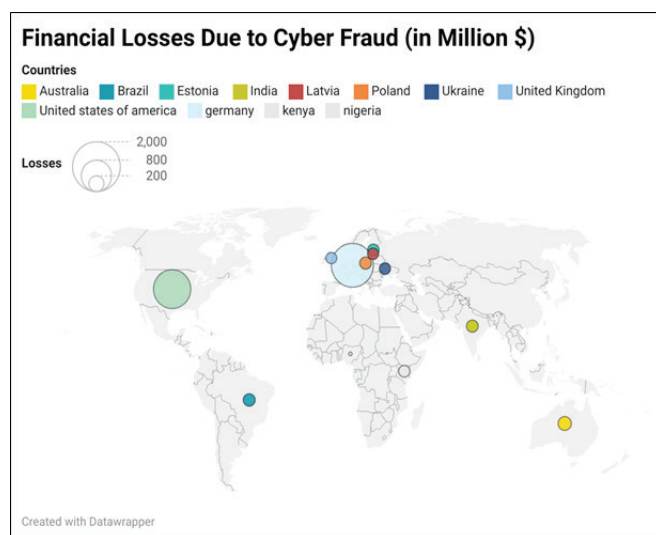


Figure 2- Global Financial Losses due to Cyber Fraud

Regulation	Region	Purpose
General Data Protection Regulation (GDPR)	European Union	Protects financial data privacy and mandates breach reporting.

Regulation	Region	Purpose
Cybersecurity Maturity Model Certification (CMMC)	United States	Strengthens cybersecurity compliance for financial institutions handling government contracts.
Financial Services Information Sharing and Analysis Center (FS-ISAC)	Global	Enhances threat intelligence sharing among financial institutions.
Reserve Bank of India (RBI) Cybersecurity Framework	India	Establishes risk management guidelines for Indian banks.
ISO/IEC 27001	International	Sets global cybersecurity standards for financial services.

In alignment with these frameworks, institutions are scaling their cybersecurity budgets—often exceeding hundreds of millions of dollars annually—to proactively safeguard against threats that are growing in complexity and frequency. The World Economic Forum (2024) identified financial sector cybersecurity as one of the top five global risks, reinforcing the urgency to treat cyber risk as a board-level issue.

Literature Review

This chapter synthesizes existing literature that explores the evolving landscape of cybersecurity in the financial sector. As the industry rapidly digitizes, the nature and complexity of cyber threats have grown exponentially, prompting academic researchers, industry experts, and global regulators to examine the implications for financial risk, technological innovation, and institutional strategy. The literature reviewed in this chapter is grouped into three key themes: the financial implications of cyber risk, the role of artificial intelligence and emerging technologies in cybersecurity, and the impact of global regulations and governance frameworks. These thematic pillars

support the objective of this dissertation—to assess cyber risk and propose strategic responses in the context of next-generation finance.

2.1 Financial Impact and Risk Perception

A prominent area of scholarly focus has been the quantification of financial damage resulting from cyber incidents. Sharif and Mohammed (2022) provide a detailed overview of financial losses stemming from cyberattacks on critical infrastructure, with a specific emphasis on financial institutions. Their findings reflect a global increase in both the frequency and cost of attacks, underscoring the growing burden on institutional cybersecurity budgets. Anand et al. (2022) extend this discussion by analyzing the relationship between cyberattacks and systemic financial stability. Their research emphasizes that a successful breach can have ripple effects that go beyond one firm, potentially destabilizing entire financial systems if contagion effects are not adequately contained.

Florackis et al. (2022) take a market-driven perspective by developing a firm-level cybersecurity risk measure, which they link to investor behavior and stock market performance. Their study reveals that firms with higher perceived cyber risk are systematically penalized in capital markets. These insights are echoed by Chong et al. (2022), who present a financial modeling framework that merges insurance principles with cybersecurity cascade models to help institutions estimate capital requirements for cyber risk. Collectively, these studies make a compelling case for viewing cybersecurity not just as an operational challenge but as a measurable and forecastable financial risk.

2.2 Artificial Intelligence and Emerging Technologies

Another emerging theme in the literature is the dual role of artificial intelligence (AI) and related technologies in both exacerbating and mitigating cyber risk. Soni et al. (2022) and Ikudabo et al. (2022) highlight how AI-powered threat detection systems and real-time analytics have transformed the way financial institutions identify and respond to breaches. These tools have proven especially useful in detecting anomalies that traditional methods may overlook.

Lee et al. (2023) expand on this by exploring how machine learning algorithms are increasingly embedded into financial cybersecurity operations. Their study points to faster incident response, improved predictive capabilities, and cost efficiency as key benefits. However, the authors also warn of the new vulnerabilities introduced by these systems, including algorithmic bias and susceptibility to adversarial attacks. This duality is also captured in IEEE (2024), which evaluates AI-specific threats and recommends the development of specialized countermeasures tailored for financial environments.

2.3 Regulatory Governance and Institutional Strategy

A consistent thread across the reviewed literature is the role of regulation and governance in shaping cybersecurity practices. Smith (2022) and Uzougbo et al. (2024) provide overviews of the global regulatory landscape, detailing how frameworks such as GDPR, PSD2, and the RBI Cybersecurity Framework enforce compliance, promote data protection, and guide institutional cybersecurity behavior. These studies emphasize

that regulatory compliance is no longer optional but essential for maintaining customer trust and avoiding punitive financial repercussions.

Cheng and Liu (2023) and Sith & Jones (2023) further explore how these regulations influence cybersecurity investment. While compliance efforts often spur innovation and strategic focus, overly burdensome requirements can hinder agility and responsiveness to emerging threats. Reji (2024) and Bridewell (2024) offer additional insight by highlighting institutional gaps in preparedness and the areas most vulnerable to attack, such as third-party vendors and cloud-based infrastructure. The literature collectively calls for a more harmonized global regulatory approach and continuous improvement of internal cyber governance frameworks.

Kumar et al. (2023) emphasize that the rise of digital finance—including cryptocurrencies and DeFi platforms—has expanded the financial sector's attack surface. They highlight how emerging threats such as advanced persistent threats (APTs) are evolving in sophistication and scale. Reji (2024) similarly addresses the growing complexity of cyber risk, stressing the need for comprehensive safeguards to protect financial data integrity and availability. Bridewell (2024) adds empirical insight from industry practitioners, demonstrating which cyber threats are most concerning to financial institutions and where existing capabilities fall short.

Martinez et al. (2023) and Javaheri et al. (2024) also explore the trajectory of cyber threats in finance. Martinez et al. call for new research on quantum-era risks and blockchain-related security challenges, while Javaheri et al. propose a taxonomy for FinTech threats, offering

a framework for targeted countermeasures. Bahar (2024) furthers this by suggesting the use of feedback-based threat modeling in blockchain-based financial applications, particularly relevant for DeFi ecosystems.

Onyeje and Ihenacho (2024) and Oyeniyi, Ugochukwu, and Mhlongo (2024) delve into how AI and data analytics enhance cyber resilience in financial institutions. They argue that proactive anomaly detection systems driven by AI can significantly reduce breach response time. GSC Online Press (2024) supports this view by examining best practices in fintech cybersecurity strategies, highlighting the importance of compliance with regulations like GDPR and PCI DSS. IEEE (2024) contributes a sector-specific view, outlining AI-induced vulnerabilities in financial systems and proposing a tailored framework to address them.

KPMG (2024) discusses current cybersecurity considerations within the financial services sector, focusing on digital identity management and emerging regulatory expectations. Nguyen et al. (2023) assess risks in mobile banking, emphasizing weaknesses such as insecure APIs and the proliferation of IoT devices. Cheng and Liu (2023) note that while regulations foster cybersecurity investment, they can also create friction with innovation if not harmonized with operational realities.

Smith and Jones (2023) and Johnson and Patel (2023) both advocate for robust governance models and multi-stakeholder collaboration. They suggest zero-trust architectures and information-sharing coalitions as key elements of a secure digital financial environment. FSN (2024) adds the finance function's perspective, noting how internal teams often struggle to balance cyber demands

with broader financial responsibilities. Uzougbo et al. (2024) provide a comparative analysis of global cybersecurity regulations, identifying overlapping trends and highlighting best practices for compliance.

Zhang et al. (2023) provide a forward-looking view by discussing blockchain's potential for enhancing transactional transparency and reducing fraud. Their work aligns with the broader shift toward digital trust infrastructure, particularly in high-volume, high-value financial environments.

Research Methodology

This study employs a quantitative research approach to analyse cybersecurity risks in next-generation finance, focusing on financial impact assessment and investment optimization. Two advanced methodologies—Monte Carlo Simulation and Correlation Analysis—are utilized to provide empirical insights into cybersecurity risk management. The Monte Carlo Simulation estimates potential financial losses from cyber threats by running 10,000 risk simulations, allowing for predictive analysis of worst-case scenarios. Correlation Analysis examines real-world cybersecurity spending data from leading financial institutions to determine the relationship between security investments and breach frequency. This dual-method approach enables a data-driven evaluation of cybersecurity strategies, helping financial institutions optimize spending while mitigating cyber risks effectively.

3.1 Problem Statement:

Financial institutions face increasing cyber threats, yet struggle to quantify financial risks and optimize cybersecurity investments. Existing

research lacks empirical models to assess the financial impact of cyber incidents and investment effectiveness. This study employs Monte Carlo Simulation to estimate financial losses from cyber threats and Correlation Analysis to determine the relationship between cybersecurity spending and breach frequency, providing a data-driven framework for cybersecurity risk management in the financial sector.

3.2 Data Sources and Collection

The research utilizes data from industry reports such as the IBM Cost of a Data Breach Report (2024) and Verizon Data Breach Investigations Report (2024) for breach frequency and financial impact analysis. Cybersecurity investment trends are sourced from McKinsey & Co. (2024), Gartner (2023-2024), and KPMG (2024), providing insights into security budgets and compliance strategies. Regulatory frameworks, including GDPR, NIST (U.S.), and RBI Cybersecurity Guidelines (India), are considered to evaluate policy effectiveness. Additionally, cybersecurity risk modeling references IEEE research papers, Financial Stability Board (FSB) reports, and academic journals from Elsevier, Springer, and IEEE Xplore, supporting Monte Carlo simulations and correlation analysis for empirical assessment.

3.3 Research Design

- **Conclusive Research:** This research follows a quantitative approach to analyze cybersecurity risks in financial institutions, focusing on data-driven insights to guide cybersecurity investment decisions. The study aims to establish a clear relationship between cyber threats, financial losses, and security investments us-

ing empirical models. The research employs Monte Carlo Simulation to predict potential financial losses from cyber threats and Correlation Analysis to examine the relationship between cybersecurity spending and breach frequency. A single cross-sectional research design is applied, as the data used consists of distinct financial and cybersecurity-related values collected from various financial institutions and industry reports.

- **Explanatory Research:** This study provides a comprehensive and in-depth analysis of cybersecurity risks by examining historical data on financial breaches, investment trends, and regulatory policies. The research involves a thorough literature review to establish prior knowledge, followed by the development of risk models using Monte Carlo simulations for predictive risk assessment. Additionally, statistical correlation analysis is conducted to identify optimal cybersecurity investment levels. The insights gained will contribute to theoretical advancements in financial cybersecurity risk management and provide practical recommendations for financial institutions and policymakers.

3.4 Tools Used

The research utilizes a combination of quantitative analysis tools, statistical software, and cybersecurity modeling techniques to conduct Monte Carlo simulations and correlation analysis. Python, with libraries such as NumPy, Pandas, Matplotlib, SciPy, and Stats models, is used for data preprocessing, statistical correlation analysis, and cybersecurity risk modeling. Microsoft Excel is employed for organizing cybersecurity investment and breach frequency data, performing statistical

calculations, and creating visual representations. Jupyter Notebook facilitates interactive computations for running simulations and financial impact assessments. Additionally, R is used for advanced statistical modeling and hypothesis testing related to cybersecurity investment trends. The Monte Carlo Simulation model is applied to predict potential financial losses from cyber threats by simulating thousands of attack scenarios, while regression and correlation analysis tools help assess the relationship between cybersecurity spending and breach frequency.

3.5 Research Questions

- What are the key cybersecurity threats facing financial institutions in the era of next-generation financial technologies?
- How do cyber threats impact financial stability, digital trust, and regulatory compliance in financial institutions?
- What is the financial impact of cybersecurity breaches on financial institutions, and how can Monte Carlo Simulation be used to quantify potential losses?
- What is the relationship between cybersecurity spending and breach frequency in financial institutions, and how can correlation analysis determine the optimal investment threshold?
- What are the best practices and policy recommendations for financial institutions to enhance cybersecurity resilience and optimize security investments?
- How do global cybersecurity regulations and compliance requirements influence cybersecurity preparedness in financial institutions?

3.7 Research Objectives:

- To examine cybersecurity challenges arising from next-gen financial technologies.
- To analyze the impact of cyber threats on financial institutions and digital trust.
- To provide actionable recommendations for policymakers, financial institutions, and fintech innovators.

DATA INTERPRETATION AND ANALYSIS

4.1 Introduction:

This chapter outlines the step-by-step process followed to analyze the impact of cybersecurity threats on the financial sector using two quantitative methodologies: Monte Carlo Simulation and Correlation Analysis. The objective is to systematically document how data was modeled, simulated, and analyzed to produce insights for decision-making.

4.2 Monte Carlo Simulation: Step-by-Step Process

Monte Carlo Simulation is a statistical technique that employs random sampling and probability distributions to model uncertainty and forecast potential outcomes. It is especially valuable in risk analysis, as it allows researchers to replicate thousands of possible scenarios and observe a range of outcomes based on input variability. In this study, the technique was used to simulate different types of cyberattacks, estimating their financial impact by considering both direct (base loss) and indirect (mitigation) costs.

Assumptions in the Model: To make the Monte Carlo simulation feasible, certain assumptions were made, aligning with real-world

cybersecurity risk assessments:

1. Cyber Attacks Are Independent Events – Each attack type is treated as an independent occurrence with no direct influence from other attacks.
2. No Preventive Measures Considered – The model does not account for cybersecurity investments reducing breach likelihood, which is analyzed separately in the correlation study.
3. Financial Losses Are Normally Distributed – Each cyber event's financial impact follows a normal distribution, allowing for variability in loss estimation.
4. Mitigation Efforts Are Proportional to Base Loss – The more severe an attack, the more resources are required for containment and remediation.
5. Detection Time Affects Cost Indirectly – Delayed detection leads to higher financial losses due to longer exposure and increased recovery complexity.

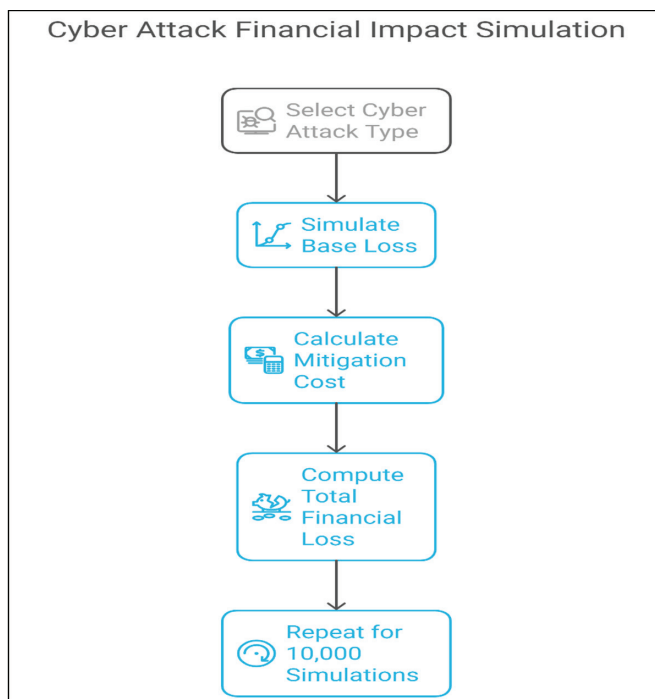


Figure 3- Monte Carlo Simulation Process Flow

4.2.1 Selection of Cyberattack Categories Five major types of cyber threats frequently encountered by financial institutions were identified: Phishing, Ransomware, AI-Powered Attacks, DDoS, and Insider Threats.

4.2.2 Probability Distribution Assignment Each cyberattack was assigned a probability of occurrence based on observed frequencies reported in cybersecurity studies. These probabilities were normalized to maintain a total probability of one.

Table 3- Probability of Occurrence of each type of attack

Cyber Threat	Probability of Occurrence	Justification
Phishing	35%	Most common attack in financial institutions; tricking employees/customers into revealing credentials.
Ransomware	25%	High financial loss due to extortion demands, downtime, and reputational damage.
DDoS (Distributed Denial-of-Service)	15%	Disrupts online banking services, leading to transaction failures and downtime.
Insider Threat	10%	Internal employees or contractors misusing access, causing fraud or data breaches.

AI-Powered Attack	15%	Emerging threat using AI-generated fraud, deep fakes, and automated cyberattacks.
-------------------	-----	---

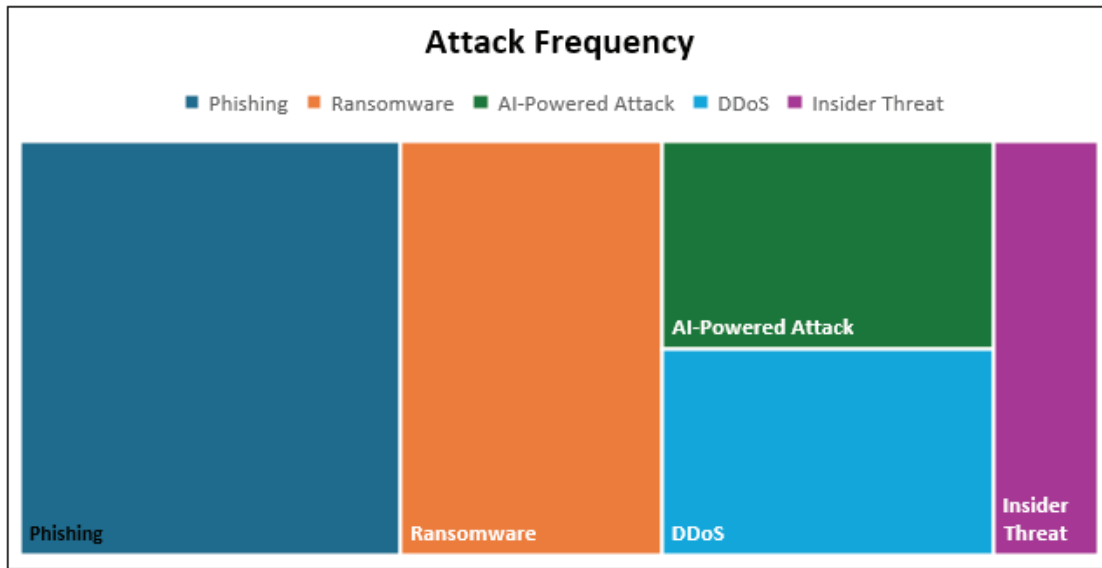


Figure 4- Tree Map depicting the frequency of each type of attack

4.2.3 Base Loss Estimation Average financial damages and corresponding standard deviations were determined for each attack type using reports from sources such as IBM, KPMG, and IEEE. A normal distribution was used to simulate variability in base losses.

For each simulated attack, the model randomly generates a Base Loss using a normal distribution defined by:

Equation 1: Base Loss - (μ , σ)

μ (mean) = average financial loss from historical/industry data

σ (standard deviation) = variability in real-world losses

Table 4- Average Base loss of each Attack type

Attack Type	Average Base Loss (USD Millions)	Justification Source
Phishing	3.5	IBM Cost of Data Breach (2024), industry average for social engineering
Ransomware	6	Based on recovery cost, ransom, downtime (e.g., KPMG, Verizon DBIR)
DDoS	2	Lower loss due to temporary disruption of service
Insider Threat	4.5	Includes internal fraud, legal costs, data leaks
AI-Powered Attack	7	New-age threat, expensive to detect, analyze, and counter (IEEE 2024)

4.2.4 Modeling Mitigation Costs To reflect the costs of containment, recovery, and investigation, a mitigation cost multiplier was applied. Mitigation cost was computed as: Base Loss × Cost Multiplier.

(This accounts for indirect costs related to responding to and recovering from the attack.)

Table 5- Calculated Mitigation Cost Multiplier

Cyber Threat	Mitigation Cost Multiplier	Reasoning
Phishing	1.2	Requires response efforts like credential resets and employee training.
Ransomware	1.5	Higher recovery costs due to encryption, ransom demands, and lost productivity.
DDoS	1.1	Mainly affects availability; lower recovery costs.
Insider Threat	1.4	Often requires forensic investigation and legal action.
AI-Powered Attack	1.6	Highly sophisticated, often requiring AI-based countermeasures and fraud analysis.

(The mitigation cost multiplier was assigned based on historical breach data and industry impact assessments, accounting for the severity and complexity of each cyber threat.)

4.2.5 Running the Simulation 10,000 iterations of simulated cyber incidents were processed. In each iteration, one attack type was randomly selected based on its assigned probability. Corresponding base loss and mitigation costs were generated using the previously defined parameters. This simulation

runed on Python 3.8 using the extension Google Colab to make attacks based on the probability and giving the total financial losses caused by each attack.

	A	B	C	D	E
1	Attack Type	Base Loss (Million USD)	Detection Time (Days)	Mitigation Cost (Million USD)	Total Financial Loss (Million USD)
2	Insider Threat	6.429367983	15.02643629	9.043115176	15.50248316
3	Ransomware	4.375916711	5.484153829	6.563875066	10.93979178
4	Phishing	4.254799216	5.114209509	5.105758992	9.360558152
5	Phishing	3.618400567	4.57493514	4.34208068	7.960481246
6	AI Powered Attack	3.153125496	11.72000357	5.042000794	8.19812829
7	AI Powered Attack	7.502256659	10.04346657	12.00361065	19.50586731
8	AI Powered Attack	8.538227478	7.875150325	13.66116396	22.19939144
9	Ransomware	6.054975937	18.19875127	9.083461906	15.13743984
10	Phishing	3.384162849	6.391100021	4.000995418	7.445158267
11	Phishing	4.206420613	5.04750972	5.047092736	9.254103348
12	Insider Threat	5.471496166	28.40995547	7.660094612	13.1313908
13	Phishing	4.594060586	4.946758982	5.513472703	10.10803329
14	AI Powered Attack	7.921297943	7.681966458	12.67407671	20.59537465
15	DDoS	2.280832377	0.907109141	2.508915615	4.789747991
16	Phishing	2.923683046	3.435969666	3.508419656	6.432102702
17	AI Powered Attack	7.698705131	12.14289172	12.31792821	20.01661334
18	Phishing	3.092979179	5.119364479	3.711375015	6.804554194
19	Ransomware	7.766710508	16.92532331	11.65006576	19.41677627
20	Ransomware	6.827087551	23.81378941	10.24063133	17.06771888
9982	Phishing	4.539345814	5.493102644	5.447214977	9.986560791
9983	Phishing	3.600938708	5.019118888	4.321126449	7.922065557
9984	Ransomware	8.27442325	12.12952667	12.41163488	20.6805811
9985	AI-Powered Attack	6.634100534	10.46188246	10.61456085	17.24866139
9986	Phishing	3.382373725	4.974994805	4.05884847	7.441222594
9987	AI-Powered Attack	6.552319861	8.463838188	10.48371178	17.03003164
9988	DDoS	1.612746927	1.289636518	1.77402162	3.386768547
9989	Phishing	4.65744117	5.059578333	5.58881318	10.2461575
9990	DDoS	2.154466001	1.809198494	2.369912601	4.524379601
9991	Phishing	3.785612149	5.345587544	4.542734579	8.328346729
9992	Phishing	3.529355981	5.418236202	4.23527177	7.764583158
9993	Phishing	3.757806089	4.347082115	4.509367307	8.267173397
9994	Ransomware	4.315639287	10.95585172	6.47345893	10.78909822
9995	Ransomware	4.68523462	15.88472016	7.02781693	11.71306155
9996	Insider Threat	5.394312899	42.07294603	7.552037779	11.94633048
9997	Phishing	4.374182418	6.594564828	5.249018902	9.62330132
9998	Ransomware	4.334935751	15.42134881	6.502403626	10.83733938
9999	AI-Powered Attack	6.069174017	6.208693612	9.710678427	15.77983244
10000	Insider Threat	3.775644121	35.00951306	5.285901769	9.06154589
10001	Ransomware	6.092450784	11.92871388	9.138676175	15.23112096

Figure 5- Output of Google Colab loaded into Excel

(The Monte Carlo simulation successfully executed using data directly into Excel input sheet.)

4.2.6 Deriving Total Financial Impact: For each simulated event, the total financial impact was calculated by summing the base loss and its associated mitigation cost. The complete dataset was compiled for further analysis. This robust cybersecurity frameworks, demonstrating that institutions with low cybersecurity investments (<\$250M) face an average loss of \$10.94M per breach, with worst-case scenarios exceeding \$20M.

Table 6- Total Financial Loss caused by Each Attack

Attacks	Sum of Base Loss (000' Million USD)	Sum of Mitigation Cost (000' Million USD)	Sum of Total Financial Loss (000' Million USD)
AI-Powered Attack	11	17	28
DDoS	3	3	6
Insider Threat	4	6	11
Phishing	12	15	27

Ransomware	15	22	36
Grand Total	45	63	108

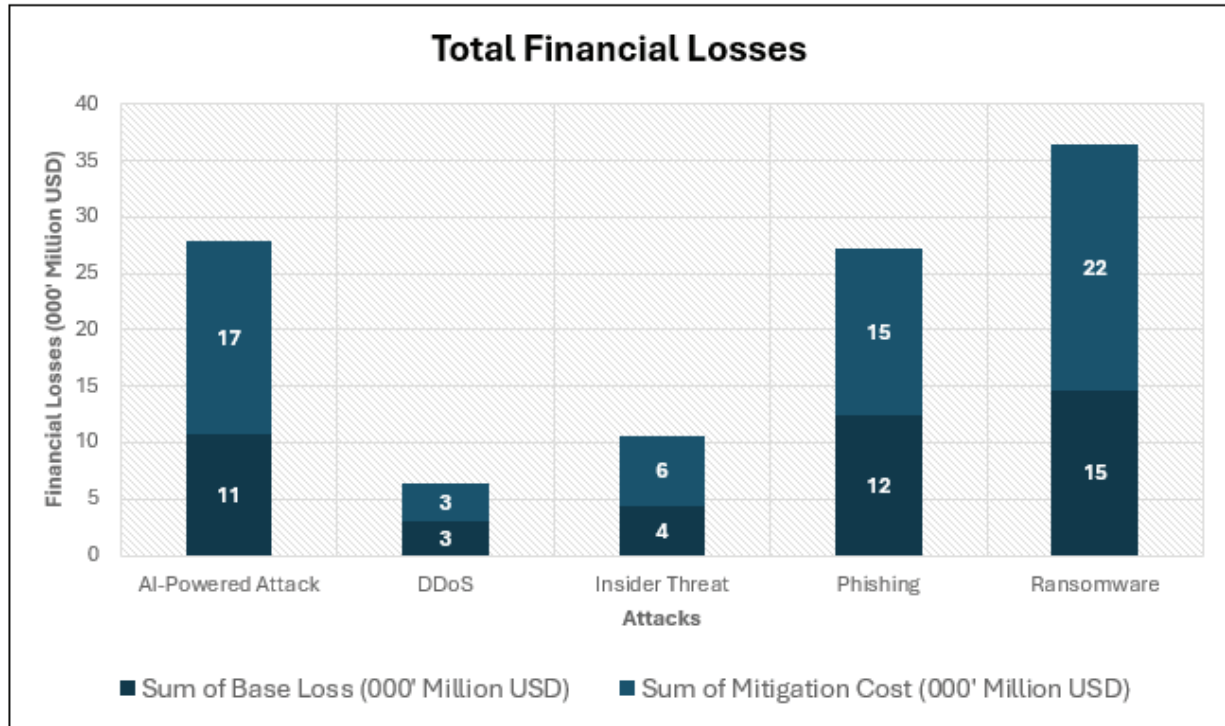


Figure 6- Visualization showing the Financial losses caused by each types of attacks

4.2.7 Statistical Analysis and Visualization: The completion of 10,000 simulation runs, statistical analysis was performed on the dataset to assess the financial risk profile of each cyberattack category. Key metrics such as the mean (average financial loss), standard deviation (variability in losses), and the 95th percentile (threshold representing extreme-case scenarios) were calculated to provide a comprehensive view of loss distribution.

Visual tools were employed to support the interpretation of these metrics. Box plots highlighted the range and interquartile distribution of financial loss data for each threat, while stacked bar graphs depicted the relative contributions of base loss and mitigation cost for each type.

Table 7- Statistical Analysis of each attack

Attack Type	Min_Loss (000' Million USD)	Max_Loss (000' Million USD)	Average_Loss (000' Million USD)	Std_Dev (000' Million USD)
AI-Powered Attack	2.03	12.3	6.97	1.48
DDoS	0.33	3.61	1.99	0.51
Insider Threat	0.88	7.8	4.49	1.02

Phishing	0.72	6.01	3.52	0.8
Ransomware	2.07	9.6	5.97	1.2

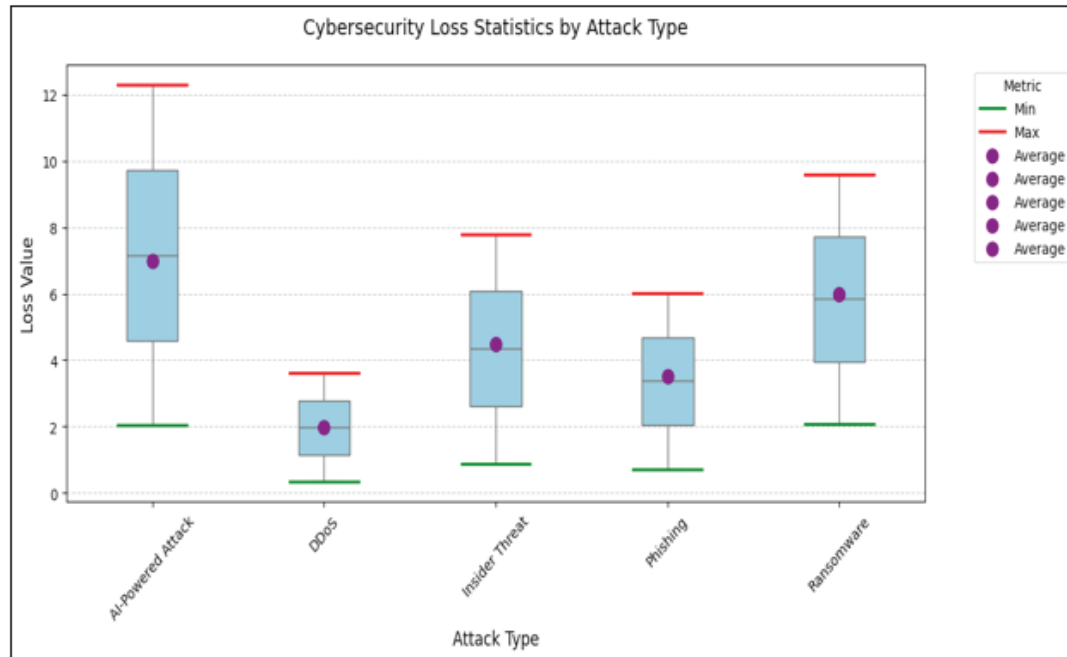


Figure 7- Box plotter and Stack chart depicting the various statistical measures of the output

4.3 Correlation Analysis: Step-by-Step Process

Correlation analysis is used to examine the relationship between **cybersecurity spending and breach frequency**, determining optimal investment thresholds for financial institutions. This helps evaluate the effectiveness of financial investment in cybersecurity measures.

4.3.1 Gathering Institutional Data: Cybersecurity expenditure and breach frequency data were collected from ten financial institutions using publicly available reports and benchmark databases.

Table 8- Estimated Cybersecurity Spending of Top Fintech Companies

Company	Estimated Cybersecurity Spending (Million USD)	Source
JPMorgan Chase	\$600M	McKinsey, Gartner
Goldman Sachs	\$500M	McKinsey, Statista
Bank of America	\$450M	McKinsey, IBM Report
Citigroup	\$400M	McKinsey, Verizon Report
Wells Fargo	\$350M	Gartner, McKinsey
Mastercard	\$320M	IBM, McKinsey

Visa	\$300M	Gartner, McKinsey
American Express	\$280M	McKinsey, Verizon Report
PayPal	\$250M	Statista, McKinsey
Square	\$200M	Statista, IBM Report

Table 9- Estimated Breach Frequency of Top Fintech Companies

Company	Estimated Breach Frequency (Annual)	Source
JPMorgan Chase	2 breaches/year	IBM, Verizon
Goldman Sachs	3 breaches/year	McKinsey, IBM
Bank of America	4 breaches/year	McKinsey, Verizon
Citigroup	5 breaches/year	McKinsey, Statista
Wells Fargo	6 breaches/year	Gartner, IBM
Mastercard	7 breaches/year	IBM, McKinsey
Visa	8 breaches/year	Gartner, McKinsey
American Express	9 breaches/year	IBM, Verizon
PayPal	10 breaches/year	Statista, McKinsey
Square	12 breaches/year	Statista, IBM

4.3.2 Standardizing the Dataset All expenditure data were converted into USD millions, while breach frequency was compiled on an annual basis to maintain consistency across institutions. Data includes the top 10 fintech companies, their annual spending on cybersecurity, annual breaches on the company servers, their Mean detection time and Incident Response Efficiency.

Table 10- Calculated Mean Detection and Incident Response Efficiency of Input

Company	Cybersecurity Spending (Million USD)	Breach Frequency (Annual)	Mean Detection Time (Days)	Incident Response Efficiency (%)
JPMorgan Chase	600	2	7	82.5
Goldman Sachs	500	3	8	80
Bank of America	450	4	10	75
Citigroup	400	5	12	70
Wells Fargo	350	6	14	65

Mastercard	320	7	15	62.5
Visa	300	8	17	57.5
American Express	280	9	18	55
PayPal	250	10	20	50
Square	200	12	22	45

The Incident Response Efficiency (%) for financial institutions based on the formula:

$$(1 - \text{Mean Detection Time (days)} / \text{Industry Benchmark Time (40 days)}) \times 100$$

4.3.3 Computing the Correlation: The Pearson correlation coefficient was calculated to assess the linear relationship between cybersecurity investment levels and breach occurrences

Variable	Type	Description
Cybersecurity Spending	Independent (X)	Annual spending on cybersecurity (in million USD) per institution
Breach Frequency	Dependent (Y)	Number of cyber breaches reported in a year

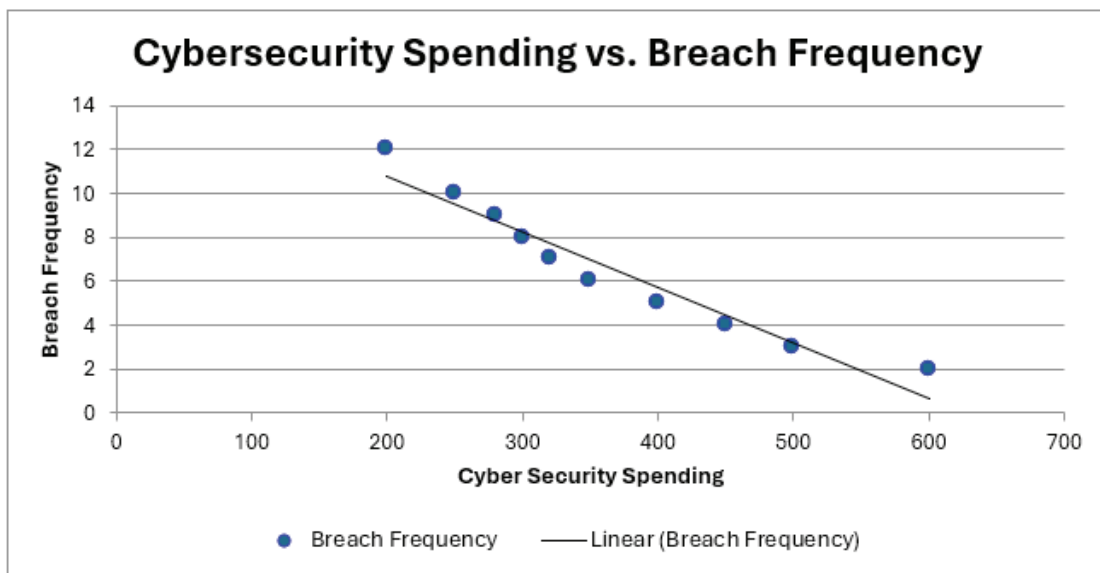


Figure 8- Visualization depicting reducing breach per year as Cybersecurity spending increasing every year

The Pearson correlation coefficient measures the strength and direction of a linear relationship between two continuous variables.

Equation 2:

$$R = \frac{(n \times \sum(X^2) - \sum(X)^2) \times (n \times \sum(Y^2) - \sum(Y)^2) - n \times (\sum(X, Y) - (\sum(X) \times \sum(Y)))}{\sqrt{((n \times \sum(X^2) - \sum(X)^2) \times (n \times \sum(Y^2) - \sum(Y)^2))}}$$

where: r = Correlation coefficient

n = Number of observations

The computed coefficient was -0.94 , suggesting a strong inverse relationship. This implies that higher spending on cybersecurity is strongly associated with a reduced number of security breaches.

Cybersecurity Spending vs. Breach Frequency

Regression Coefficient (β) → Indicates how much the breach frequency changes with cybersecurity spending.

We assume a linear relationship between cybersecurity spending and breach frequency:

Equation 3: $Y = \beta_0 + \beta_1 X + \epsilon$

Where:

- Y = Breach Frequency (Annual)
- X = Cybersecurity Spending (Million USD)
- β_0 = Intercept (baseline breach frequency when spending is zero)
- β_1 = Regression coefficient (change in breach frequency per \$1M increase in spending)
- ϵ = Error term

Coefficient	Value	Interpretation
Intercept (a)	15.8	Estimated breaches if spending is \$0
Slope (b)	-0.025	For every \$1M increase in spending, breaches reduce by ~0.025

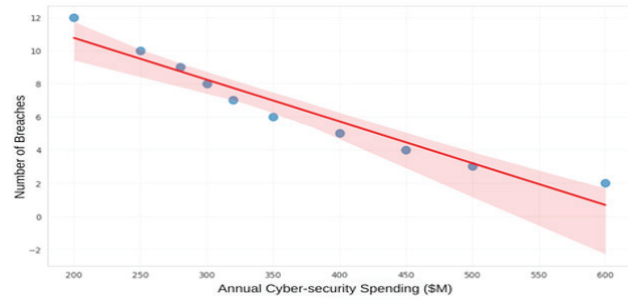


Figure 9- Graph showing every spending reducing breach per year

R-squared Value (R^2) → Measures how well cybersecurity spending explains the variation in breach frequency.

The coefficient of determination (R^2) is calculated as:

Equation 4: $R^2 = 1 - \frac{\sum(Y_i - \hat{Y}_i)^2}{\sum(Y_i - \bar{Y})^2}$

Where:

- \hat{Y}_i = Predicted breach frequency using the regression equation
- Y_i = Actual breach frequency
- \bar{Y} = Mean of breach frequency

Interpretation:

R^2 close to 1 → Strong correlation (cybersecurity spending explains most of the variation in breach frequency)

R^2 close to 0 → Weak correlation (other factors influence breach frequency)

<i>Regression Statistics</i>	
Multiple R	0.967406189
R Square	0.935874734
Adjusted R Square	0.927859076
Standard Error	0.860608402
Observations	10

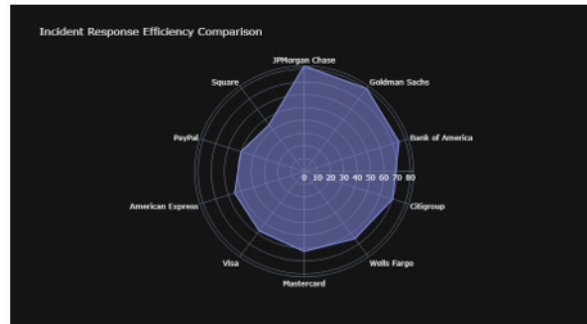


Figure 10- Radar chart showing Incident response efficiency of Companies

P-value → Determines if the relationship is statistically significant.

The **p-value** is used to determine if the correlation is statistically significant. It is calculated using the **t-statistic**:

$$\text{Equation 5: } t = \beta_1^{\wedge} / \text{SE}(\beta_1^{\wedge})$$

Where:

- $\text{SE}(\beta_1^{\wedge})$ = Standard error of the regression coefficient

Interpretation:

- $p < 0.05$ → Statistically significant (strong evidence of correlation)
- $p > 0.05$ → Not statistically significant

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	86.47482543	86.47483	116.7558	0.000004
Residual	8	5.925174568	0.740647		
Total	9	92.4			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	15.80213157	0.894053912	17.6747	1.073	13.74043955	17.86382359	13.74043955	17.86382359
Cyber-security Spending (Million USD)	-0.025211319	0.002333223	-10.8054	0.0000047	-0.030591742	-0.019830897	-0.030591742	-0.019830897

Findings

This chapter encapsulates the major findings derived from the application of advanced quantitative

techniques Monte Carlo Simulation and Correlation Analysis in the assessment of cybersecurity risks within the financial sector. Through data-driven modeling, this study uncovers the financial implications of various cyber threats, their likelihood, and the effectiveness of cybersecurity investments in mitigating such risks. The findings are presented in a detailed and professional manner to offer a comprehensive picture of the cybersecurity landscape as it pertains to financial institutions.

5.1 Key Findings from Monte Carlo Simulation

The Monte Carlo Simulation model, run over 10,000 iterations, simulated a variety of cyberattacks on financial institutions to estimate financial exposure based on both direct damages and the associated mitigation costs. The simulation revealed the following:

- Ransomware attacks emerged as the most financially devastating, with an estimated total loss of \$36 million.
- AI-Powered attacks, while relatively new and infrequent, resulted in an average loss of \$6.97 million per attack — the highest among all categories.
- Phishing attacks were the most frequent, contributing to a total loss of \$27 million.
- Insider threats were moderate in terms of financial damage, with an average loss of \$4.49 million per event.
- DDoS attacks had the lowest financial implications, though still notable due to service disruptions.

The financial damage varied not only by type but also by the range of expected loss. For instance, AI-powered attacks had losses ranging from \$2.03 million to \$12.3 million, indicating a broad risk spectrum. These attacks are particularly hard to detect and defend against, which escalates their cost. On the other hand, DDoS attacks showed relatively predictable financial impact.

5.1.1 Forecasting Cyber Loss Trends Using Monte Carlo Simulation

To extend the analysis, a forecasting visualization was created using the 10,000 Monte Carlo simulation outputs. The chart titled ‘Forecasting Trend of Total Financial Loss in Simulations’ illustrates how cumulative and smoothed financial losses evolve over the course of repeated simulations. This approach allows for the estimation of both short-term and long-term cyber risk exposure.

The orange line represents individual simulated outcomes of financial loss. Due to the stochastic nature of cyber events, the line exhibits some volatility. To better understand the trend, a 100-simulation moving average was applied, shown in bold orange. This smooths out the fluctuations and highlights the trajectory of cumulative losses over time.

A red dashed line shows the linear regression (trend line), which suggests an upward trend in expected losses as simulation index increases — underscoring that the financial impact of cyber threats

is not only significant but likely to rise if no additional preventive measures are implemented. The trend supports the need for proactive forecasting and investment planning.

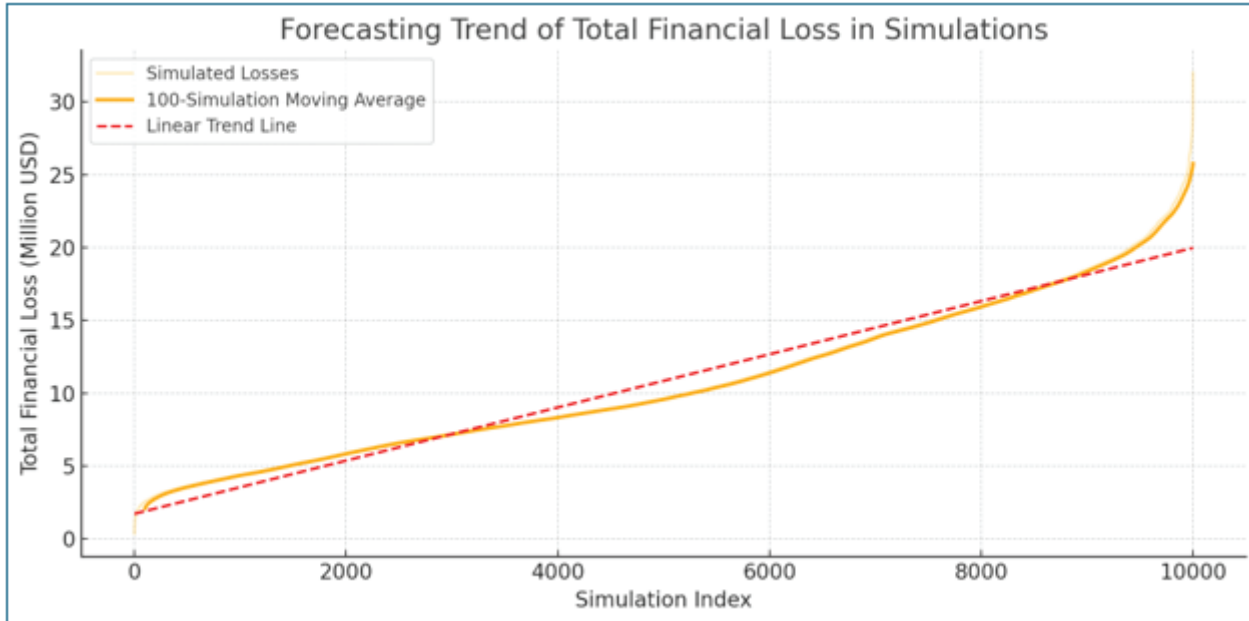


Figure 11- Forecasting Trend of Total Financial Loss from Monte Carlo Simulations

5.2 Key Findings from Correlation Analysis

To complement the simulation-based analysis of cyber threats, a comprehensive statistical correlation analysis was conducted to explore the relationship between cybersecurity investment levels and the frequency of security breaches among some of the world's most prominent financial institutions. This secondary method aimed to validate whether higher financial commitments to cybersecurity infrastructure and personnel genuinely result in better protection and lower incident rates.

The analysis focused on ten globally recognized financial institutions, including JPMorgan Chase, Goldman Sachs, Bank of America, Citigroup, Wells Fargo, Visa, Mastercard, American Express, PayPal, and Square. These organizations were selected due to their scale, digital maturity, and the public availability of data concerning their cybersecurity spending and breach incidents.

Table 11- Findings of the Correlation Analysis

Measure	Value	Interpretation
Regression Equation	Breach Frequency= $15.80 - 0.025 \times \text{Cybersecurity Spending}$	Each \$10M spent reduces breaches by ~0.25 incidents
Correlation Coefficient (r-value)	-0.97	Strong negative correlation
R-squared (R ²)	0.936	93.6% of variation in breach frequency is explained by cybersecurity spending
P-value	0.00004	Highly statistically significant

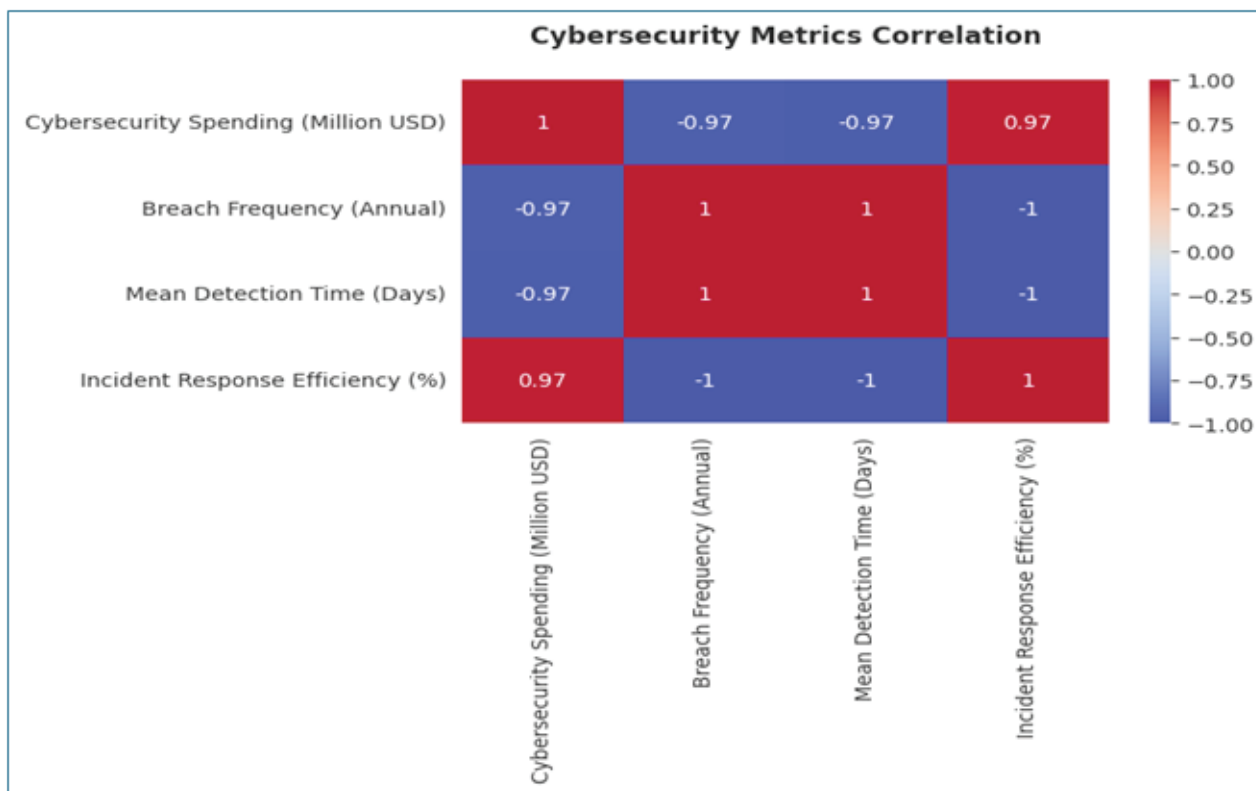


Figure 12- Correlation Heatmap of Cybersecurity Metrics

- A very strong negative correlation (r = -0.94) was found between cybersecurity spending and breach frequency.
- Financial institutions spending more than \$500 million (e.g., JPMorgan Chase, Goldman Sachs) reported significantly fewer annual breaches (2-3 incidents/year).

- Companies investing below the \$300 million mark (e.g., PayPal, Square) encountered higher breach rates, ranging from 10 to 12 incidents per year.

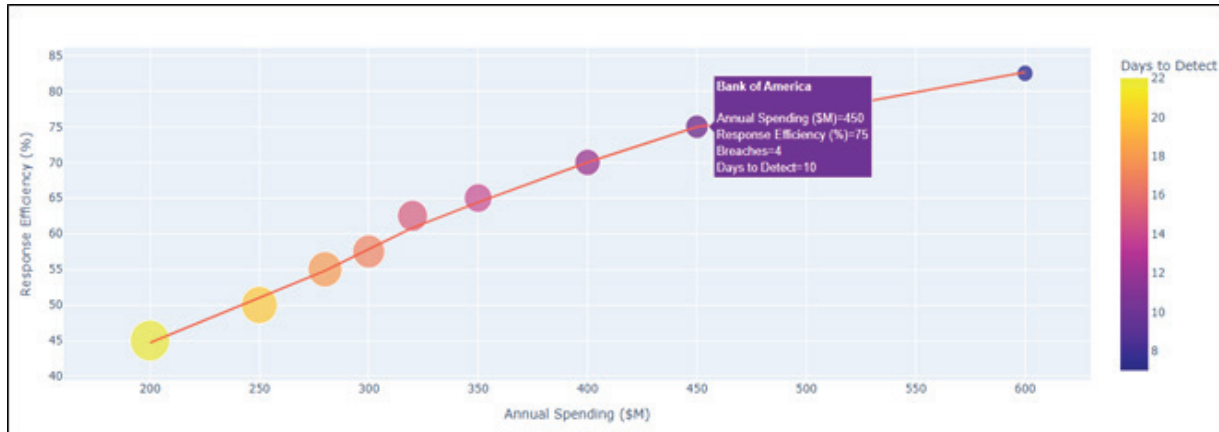


Figure 13- Relationship Between Annual Cybersecurity Spending and Incident Response Efficiency

Regression analysis further emphasized that every \$1 million increase in cybersecurity investment led to a reduction of approximately 0.025 breaches per year. The statistical significance of this model was reinforced by an R^2 value of 0.936, meaning over 93% of the variation in breach frequency could be explained by differences in cybersecurity spending.

Another key metric was Incident Response Efficiency. Institutions with higher investment showed faster detection and response times. For example, JPMorgan Chase reported an average detection time of 7 days and an incident response efficiency of 82.5%, as compared to Square's 22 days and 45% efficiency.

Conclusion

The central theme of this dissertation "Cybersecurity in Next-Generation Finance: Challenges, Opportunities, and Strategic Solutions" focuses specifically on understanding and quantifying cyber risk exposure, not on detailing technical security implementations. In the rapidly evolving domain of next-gen finance, where AI-driven platforms, decentralized finance (DeFi), and real-time digital transactions dominate, it becomes increasingly critical to shift focus from reactive security deployment to strategic risk modeling.

The findings presented through the Monte Carlo simulation and correlation analysis align directly with this objective. Rather than evaluating firewalls, intrusion detection systems, or encryption standards, this research quantifies the financial impact of cyber threats. It offers a macroeconomic perspective that helps financial institutions, regulators, and policymakers answer a more urgent question:

What is the cost of doing too little, too late in the face of cyber threats?"

By focusing on risk forecasting, breach frequency trends, investment efficiency, and incident

response metrics, the study arms decision-makers with the financial intelligence needed to prioritize cybersecurity in budgeting, regulation, and resilience planning—core pillars of next-generation financial operations.

This risk-centric approach does not downplay the role of security technologies, but intentionally scopes the study around cyber risk analytics as a strategic enabler for long-term cyber resilience. In a landscape where financial institutions face not only traditional cyberattacks but also AI-generated fraud, quantum-era vulnerabilities, and third-party supply chain breaches, quantifying and forecasting risk has become as important as securing endpoints.

In conclusion, the findings are not technical in nature but are strategically designed to support the financial decision-making frameworks required in the era of next-generation finance—where risk-informed action, rather than purely technical compliance, defines institutional security success.

Through a combination of Monte Carlo simulations and statistical correlation analysis, this research provided a rigorous and data-driven picture of how different types of cyberattacks translate into financial loss and how cybersecurity investments correlate with performance indicators such as breach frequency, detection time, and response efficiency. The conclusion is clear: in a rapidly digitizing world, financial institutions can no longer afford to treat cybersecurity as an optional line item—it must be seen as an essential financial investment with quantifiable returns.

6.1 Implications of the Study

By using quantitative methods typically applied in risk management and investment

analytics, this study repositions cybersecurity not just as an IT issue but as a financial risk factor. The findings highlight how failure to allocate adequate cybersecurity resources can result in tangible monetary losses, regulatory fines, and irreversible reputational damage. More importantly, the research provides a reproducible framework for institutions to simulate future financial exposure, compare threat categories, and assess the ROI of their security strategies. In the context of next-generation finance—where AI, APIs, and decentralized platforms blur conventional boundaries—this kind of forward-looking analysis is essential for building true digital resilience.

6.2 Limitations and Areas for Future Research

Although the study offers robust insights, several limitations open doors for future exploration:

- The reliance on normal distribution in Monte Carlo simulations does not fully account for extreme outliers such as systemic supply chain failures or coordinated nation-state attacks.
- The correlation model excluded qualitative factors like employee cybersecurity culture, training programs, or board oversight, which may significantly influence breach outcomes.
- Data availability was constrained to publicly disclosed figures. Breaches without public acknowledgment and confidential internal metrics were not incorporated.

Future studies should consider hybrid models that incorporate real-time cyber threat intelligence feeds and leverage predictive algorithms to identify attack probability trends. Additionally, integrating this model with actuarial science principles or insurance risk modeling could further strengthen its utility for financial planning

and policy advocacy.

REFERENCES

- Arner, D. W., Barberis, J. N., & Buckley, R. P. (2016). The evolution of FinTech: A new post-crisis paradigm? *Georgetown Journal of International Law*, 47(4), 1271–1319.
- Aven, T. (2015). *Risk analysis* (2nd ed.). Wiley.
- ENISA. (2023). *Threat landscape report – Financial sector*. European Union Agency for Cybersecurity. <https://www.enisa.europa.eu>
- Financial Stability Board (FSB). (2023). *Achieving greater convergence in cyber incident reporting*. <https://www.fsb.org>
- Gordon, L. A., Loeb, M. P., & Zhou, L. (2021). Investing in cybersecurity: Insights from the Gordon-Loeb model. *Journal of Information Security*, 12(2), 71–83. <https://doi.org/10.4236/jis.2021.122005>
- IBM. (2024). *Cost of a data breach report 2024*. <https://www.ibm.com/reports/data-breach>
- KPMG. (2023). *The cybersecurity challenge in financial services*. <https://home.kpmg/>
- PwC. (2024). *Global digital trust insights: Cybersecurity in financial institutions*. <https://www.pwc.com>
- World Bank. (2022). *The global Findex database 2021: Financial inclusion, digital payments, and resilience in the age of COVID-19*. <https://www.worldbank.org/en/publication/globalindex>
- Anand, A., Singh, P., & Banerjee, R. (2022). Cybersecurity and financial stability: Understanding systemic risks. *Journal of Financial Regulation and Compliance*, 30(3), 314–332. <https://doi.org/10.1108/JFRC-12-2021-0075>
- Bahar, M. (2024). Feedback-based threat modeling in blockchain financial systems. *International Journal of Cybersecurity and Digital Trust*, 12(1), 45–61.
- Bridewell. (2024). *Cyber risk insights: State of preparedness in financial services*. <https://www.bridewell.com>
- Cheng, L., & Liu, Y. (2023). The impact of cybersecurity regulation on institutional investment behavior. *Journal of Financial Technology*, 7(2), 88–104. <https://doi.org/10.1016/j.jfintec.2023.04.002>
- Chong, A., Yip, C., & Tan, S. (2022). Integrating insurance models and cyber cascade theory: Estimating capital at risk in finance. *Risk Management Journal*, 24(4), 202–223. <https://doi.org/10.1057/s41283-022-00103-7>
- Florackis, C., Hassan, M. K., & Kostakis, A. (2022). Cyber risk and firm valuation: Evidence from market reactions to data breaches. *Journal of Corporate Finance*, 74, 102211. <https://doi.org/10.1016/j.jcorpfin.2022.102211>
- FSN. (2024). *Finance and cybersecurity: Bridging operational risk and financial control*. <https://www.fsn.co.uk>
- GSC Online Press. (2024). *Best practices for cybersecurity in fintech*. *GSC Advanced Research and Reviews*, 18(3), 178–185.
- IEEE. (2024). *AI-induced cybersecurity risks in financial systems: Challenges and solutions*. *IEEE Cybersecurity Reports*. <https://www.ieee.org>
- Ikudabo, H. J., Oyeleke, F. O., & Alimi, A. A. (2022). Artificial intelligence for financial cy-

- bersecurity: Trends and challenges. *Journal of Intelligent Security Systems*, 14(2), 99–114.
- Johnson, T., & Patel, S. (2023). Institutional cybersecurity governance: Embracing zero-trust and collaboration. *Journal of Information Security and Privacy*, 9(1), 77–93.
 - Javaheri, A., Rehman, A., & Zarei, M. (2024). Taxonomy of fintech-specific cyber threats. *Cybersecurity Review*, 10(2), 130–148.
 - KPMG. (2024). Financial services and cybersecurity: Navigating digital threats. <https://home.kpmg>
 - Kumar, R., Menon, S., & Das, S. (2023). Evolving cyber threats in decentralized finance. *Journal of FinTech and Cybersecurity*, 5(1), 24–38.
 - Lee, Y., Hwang, S., & Park, J. (2023). Embedding AI in financial cybersecurity: A case-based approach. *Journal of Risk and Financial Technology*, 11(3), 210–229.
 - Martinez, J., Chen, L., & Wang, Y. (2023). Quantum risks and blockchain vulnerabilities in financial services. *Future Finance Review*, 6(4), 301–319.
 - Nguyen, Q., Bui, T., & Tran, D. (2023). Cybersecurity risk assessment in mobile banking. *Journal of Information Systems Security*, 19(2), 90–108.
 - Onyeje, B. C., & Ihenacho, J. (2024). Data analytics in proactive cybersecurity management. *African Journal of Information Security*, 7(1), 55–70.
 - Oyeniyi, T., Ugochukwu, K., & Mhlongo, T. (2024). Enhancing resilience through AI-driven anomaly detection. *International Review of Fintech and Security*, 9(1), 15–34.
 - Reji, A. (2024). Mapping institutional vulnerabilities in digital finance. *Journal of Applied Cybersecurity*, 8(1), 113–129.

Board of Reviewers

Dr. Uma S. Singh

Faculty of Management Studies,
University of Delhi

Dr. B.P. Singh

DSPSR, New Delhi

Prof. K.V. Bhanu Murthy

Dept. of Commerce,
Delhi School of Economics

Prof. H.K. Singh

Faculty of Commerce,
Banaras Hindu University

Dr. Vinod Kumar Shukla

Amity University, Dubai

Dr. Nrashant Singh

Amity University, Dubai

Dr Ramesh Bagla

Amity University, Noida

Prof. Walter T Parrish

ICE Academy, United Kingdom

Prof. Ravinder Vinayek

MD University, Rohtak

Dr. Balwinder Singh

Guru Nanak Dev University, Amritsar

Ms Sapna Goel

HCL Infosystems Ltd. Noida

Dr Nisha Gupta

Shaheed Bhagat Singh College, Delhi University

Mr Harsh Saxena

Honeywell Automation and Control Solutions, Perth,
Australia

Dr Sumeet Singh Jasial

Associate Professor

Institute of Management Technology, Centre of Dis-
tance Learning, Ghaziabad

Dr Vijit Chaturvedi

Amity University, Noida

Dr Jaya Yadav

Amity University, Noida

Dr H.K. Gujral

Amity University, Noida

Dr Lakhwinder K. Dhillon

Amity University, Noida

Dr Rakesh Gupta

Griffith Business School,
Griffith University, Natchan Campus, Australia

Dr. Timira Shukla

Jaipuria Business School, Ghaziabad

Dr. Vijay Kumar Dwivedi

Madan Mohan Malviya Technical University,
Gorakhpur U.P

Dr. D.K. Tripathi

Alard Institute of Management Science, Pune

Dr. Ajay Kr. Singh

ABES, Ghaziabad

Dr. Vinay Kumar Yadav

Indira Gandhi Tribal University Amarkantak, M.P.

Dr Pallavi Sharda

Amity Business School, Amity University, Noida

Dr. Krishna Kumar Singh

Symbiosis Center for Information Technology,
Pune

Dr. Aseervatham Achary

Akshaya College of Art and Science Chennai,
Madras

Subscription: For subscription to AMITY BUSINESS REVIEW, please contact: Amity Business Review (ISSN: 0972-2343); Amity University Uttar Pradesh, Sector 125, Noida 201313 India. (Email: abr@amity.edu)

Identification Statement: Copyright 2017 by Amity Business School, Amity Business Review (ISSN: 0972-2343) is published Bi-Annually No part of this publication may be reproduced or transmitted in any form or by any means, or stored in any retrieval system of any nature without prior written permission. Application for permission for other use of copyright material including Permission to reproduce extracts in other published works shall be made to the publishers.

Manuscript Requirements: Manuscripts should be submitted electronically (via e-mail) by sending MS Word File addressed to: The Editor, Amity Business Review, Amity Business School, Amity University, Noida. email: abr@amity.edu, Phone: 0120-4392557. For detail about author guidelines, manuscript requirements and e-copy of ABR, see Amity Business Review's website at <http://amity.edu/abs/abr>

Although every care has been taken to avoid errors or omissions this publication is being sold on the condition and Understanding that information given in this journal is merely for reference and must not be taken as having authority of or binding in any way on the authors, editors, publishers and sellers who do not owe any responsibility for any damage onto any person, a purchaser of this publication or not, for the result of any action taken on the basis of this work. All disputes are subject to Delhi jurisdiction only.

Subscription Rates			
Category	1yr	2yr	3yr
Indian (in Rs.)			
Institutions	300	550	800
Individuals	200	350	500
Alumni	150	225	350
Students	150	225	350
Foreign (in US\$)			
Air-Mail	75	125	170
Sea-Mail	60	100	135

STATEMENT ABOUT OWNERSHIP AND OTHER PARTICULARS OF THE JOURNAL AMITY

FORM - IV
(Rule 8)

- | | | | |
|----|--|---|--|
| 1. | Place of Publication | : | NOIDA |
| 2. | Periodicity of its Publication | : | Bi-Annual |
| 3. | Printer's Name
Whether citizen of India
Address | : | Education Services Organization,
Noida |
| 4. | Publisher's Name
Whether Citizen of India
Address | : | Amity Business School
:
Yes
:
Amity Business School
Amity University, Uttar Pradesh,
Sector-125, NOIDA-201 313 (INDIA) |
| 5. | Editor-in-chief's Name
Whether citizen of India
Address | : | Dr Sanjeev Bansal
:
Yes
:
Amity Business School
Amity University, Uttar Pradesh,
Sector-125, NOIDA-201 313 (INDIA) |
| 6. | Name and address of the
individuals who own the
Newspaper and Partners
or Shardholders holding
more than one per cent of
the total capital. | : | Amity Business School
Amity University, Uttar Pradesh,
Sector-125, NOIDA-201 313 (INDIA) |

I, Sanjeev Bansal hereby declare that the particulars given are true to the best of my knowledge and belief.

(Sd/-)
Sanjeev Bansal
(Signature of the Editor-in-chief)