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RESEARCH ARTICLE

Bank Consolidation and the Transformation of Public Sector Banking in India: A Contemporary Perspective on Business and Organization

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ABSTRACT

Bank consolidation in India has moved beyond the traditional objective of rescuing weak institutions and increasingly become an organizational and strategic instrument for building scale, resilience, technological capability and competitive capacity. This article revisits the merger perspective of Indian bank mergers and extends the debate to the contemporary public sector banking environment. Particular attention is given to the post-2017 consolidation programme, organizational integration, business-process redesign, digital transformation, risk governance, human-resource management, customer relationships and managerial challenges. The evidence indicates that consolidation can create scale and develop the capacity to deploy technology, capital and specialized capabilities, but merger itself does not automatically generate efficiency. Integration costs, overlapping processes, employee adjustment, cultural differences, technology migration, customer retention and the management of acquired credit exposures can delay or offset expected synergies. Recent statistical evidences demonstrate a substantial strengthening of public sector bank profitability, asset quality and capital adequacy. The article therefore argues for evaluating contemporary bank mergers not only through conventional financial ratios but through a broader organizational-performance framework covering operating efficiency, digital capability, human capital, customer experience, risk management and strategic adaptability.

Keywords: bank mergers; public sector banks; organizational integration; business transformation; digital banking; risk management; economies of scale; human-resource management; India

Introduction

Organizations incessantly reassess their structures, resources and operating processes in response to technological change, competition, regulatory requirements and changing stakeholder expectations. The banking sector is particularly sensitive to these forces because banks simultaneously perform commercial, developmental and systemic functions. The study correctly places merger and acquisition within the broader search for efficiency, growth, scale and competitive advantage. It also demonstrates that earlier Indian bank-merger research concentrated greatly on conventional pre- and post-merger financial ratios and statistical comparisons.

The contemporary context is materially different. India's public sector banking structure has undergone a major consolidation since 2017. The Department of Financial Services records the merger of State Bank of Bikaner & Jaipur, State Bank of Hyderabad, State Bank of Mysore, State Bank of Patiala, State Bank of Travancore and Bharatiya Mahila Bank into State Bank of India from 1 April 2017; Vijaya Bank and Dena Bank into Bank of Baroda from 1 April 2019; and four major amalgamations from 1 April 2020: Oriental Bank of Commerce and United Bank of India into Punjab National Bank; Andhra Bank and

Corporation Bank into Union Bank of India; Syndicate Bank into Canara Bank; and Allahabad Bank into Indian Bank.

The significance of these transactions lies not basically in the formation of larger balance sheets. They altered organizational architecture, branch networks, technology platforms, human-resource structures, customer interfaces and managerial responsibilities. The central research question consequently becomes broader than whether profitability increased after a merger: how does consolidation reshape contemporary business practices and organizational processes, and what managerial challenges accompany that transformation?

From Rescue Mergers to Strategic Consolidation:

Methodological Approach and Evidence-Selection procedure

This article espouses a structured documentary and evidence-based approach to evaluate the contemporary organizational implications of public sector bank (PSB) consolidation in India. It is not presented as a causal econometric evaluation of merger effects. Instead, it integrates (i) documentary support on the institutional design and effective dates of PSB amalgamations, (ii) official sector-level banking indicators, and (iii) an investigative synthesis of organizational, technological, human-resource, customer, governance and risk-management implications. This distinction is imperative because changes in aggregate PSB performance cannot be attributed to mergers only.

Evidence identification followed three explicit criterion. First, institutional and transaction information was taken from authoritative Government of India sources, predominantly the Department of Financial Services (DFS) and its annual reports and PSB-amalgamation materials. These sources were used to institute the merger population, effective dates, stated reform objectives and the contemporary policy framework. Second, sector-performance evidence was drawn from official banking indicators reported by DFS, including gross and net NPA, capital adequacy, profitability, deposits and advances. Third, the organizational interpretation was developed by mapping documented merger consequences—such as branch and process integration, technology migration, human-resource restructuring, customer continuity and risk governance—onto a contemporary business-and-organization framework.

The analytical population comprises the major PSB amalgamations implemented from 1 April 2017 through 1 April 2020: the State Bank of India amalgamation in 2017, the Bank of Baroda amalgamation in 2019, and the four PSB amalgamations implemented in 2020. The selection is hence institutionally defined rather than based on a convenience sample. Private-sector bank mergers are outside the scope because the article specifically investigates the public-sector consolidation programme and its organizational implications.

The analysis proceeds in four stages. Stage 1 establishes the consolidation timeline and institutional context. Stage 2 documents changes in sector-level financial soundness using official indicators. Stage 3 develops a stakeholder and organizational-impact framework covering scale, operating processes, digital capability, human capital, customer experience, risk governance and strategic capability. Stage 4 derives managerial and policy implications and identifies directions for future empirical testing. The framework is intentionally broader than conventional pre/post financial-ratio analysis because merger success may be exaggerated by integration costs, restructuring, technology migration, regulatory reform, recapitalization, resolution of stressed assets and macroeconomic surroundings.

To diminish the risk of over-attribution, the article treats official performance improvements as contextual evidence rather than as proof that mergers caused those improvements. Where the evidence is descriptive, the language is correspondingly descriptive. Causal claims are reserved for future

research designs capable of identifying counterfactual effects, such as difference-in-differences with matched comparison banks, event studies, panel models, DEA/SFA and dynamic risk measures.

The study distinguishes the prior regulatory or 'forced' merger model from the increasing importance of market-led consolidation. Traditionally, weak banks were often merged with stronger institutions where the immediate concern was depositor protection and financial stability. The document notes that severe non-performing assets, erosion of net worth and deterioration in capital adequacy could trigger regulatory intervention.

The contemporary PSB consolidation programme represents a broader strategic approach. The Department of Financial Services describes consolidation as a means of leveraging economies of scale and synergies and links the PSB reform agenda with governance, prudential lending, risk management, technology- and data-driven banking and outcome-centric human resources. Thus, merger should be viewed as an organizational transformation programme rather than a one-time legal transaction.

Table:1: Contemporary PSB Consolidation: Major Merger Events

Effective date of Merger	Transferor / merged banks	Transferee bank	Contemporary strategic relevance
1 April 2017	State Bank of Bikaner & Jaipur; State Bank of Hyderabad; State Bank of Mysore; State Bank of Patiala; State Bank of Travancore; Bharatiya Mahila Bank	State Bank of India	Scale, network consolidation and integration of multiple banking operations
1 April 2019	Vijaya Bank; Dena Bank	Bank of Baroda	Scale, branch/network integration and capability consolidation
1 April 2020	Oriental Bank of Commerce; United Bank of India	Punjab National Bank	Creation of a larger PSB with broader customer and branch footprint
1 April 2020	Andhra Bank; Corporation Bank	Union Bank of India	Geographic and operational scale; platform and process integration
1 April 2020	Syndicate Bank	Canara Bank	Network, technology and operational consolidation
1 April 2020	Allahabad Bank	Indian Bank	Geographic diversification and organisational integration

Source: Department of Financial Services, Government of India. The official banking overview identifies these amalgamations and their effective dates.

Contemporary Business Implications of post 2017 Bank Mergers in India

1. Economies of scale and scope

A larger banking organization can spread technology, cyber security, compliance, analytics and specialist-management costs over a larger customer and asset base. Scale may also strengthen bargaining power with technology vendors and facilitate investment in digital infrastructure. However, scale becomes economically meaningful only when duplicated processes are actually rationalized; simply combining balance sheets does not guarantee lower unit costs.

2. Digital transformation and data-driven banking

Contemporary banking is increasingly organized around mobile interfaces, digital payments, automated credit assessment, data analytics, cyber security and integrated customer information. A merger provides an opportunity to consolidate technology platforms and standardize data architecture. At the same time, migration between legacy systems creates operational, cyber and customer-service risks. The current PSB reform framework explicitly identifies technology- and data-driven banking as a core reform area.

3. Process standardization and organizational redesign

Mergers require harmonization of credit appraisal, treasury operations, branch procedures, compliance systems, customer on boarding, grievance handling and internal controls. The organizational challenge is therefore one of process architecture: managers must decide which practices to retain, which to redesign and which to discontinue. Effective integration should be governed through measurable process-level indicators rather than relying exclusively on post-merger accounting ratios.

4. Human-resource management and organizational culture

Employees experience mergers through changes in reporting relationships, job roles, transfers, performance evaluation, promotion structures, training requirements and technology adoption. Consequently, the human dimension can determine whether projected synergies are realized. The contemporary PSB reform agenda includes outcome-centric HR, and the Government has also strengthened governance through professionalized selection and expanded specialist leadership roles.

5. Customer experience and market competitiveness

A larger bank can potentially offer a wider product portfolio and greater geographic reach. However, customers may face temporary disruption when account systems, branch processes, product codes or digital interfaces change. Contemporary merger management should therefore treat customer continuity as a strategic performance objective, including service availability, complaint resolution, digital reliability and retention.

6. Risk management and resilience

Consolidation can strengthen risk-management capability through larger specialist teams, better analytics and stronger capital buffers. But it can also increase concentration and operational complexity. The appropriate objective is therefore not merely 'bigger banks' but banks with stronger governance, risk controls, recovery capacity and information systems.

Possible Impact of recent PSBs Bank Mergers on Stakeholder

A recent PSBs bank merger in India changes more than the balance sheet. It can alter branch networks, technology platforms, reporting relationships, employee roles, customer interfaces, risk systems and relationships with regulators. The major stakeholders are employees and managers, customers, borrowers, depositors, shareholders/investors, government, regulators, trade unions, suppliers and local communities. Effects are not necessarily uniform: a gain in efficiency may simultaneously create adjustment costs for employees or customers.

Table:2: Stakeholder Impact of Bank Mergers: Potential benefits& Potential challenges

Stakeholder	Potential benefits	Potential challenges
Employees & managers	Career opportunities, wider roles, training, specialist exposure	Transfer anxiety, role duplication, changed reporting, cultural conflict, workload
Customers	Wider reach, broader products, stronger digital/service capacity	Temporary disruption, migration problems, changed branches/service procedures
Borrowers/MSMEs	Greater lending capacity, wider reach, integrated risk systems	More standardized credit processes may reduce local discretion
Depositors	Potentially stronger institution and wider access	Communication gaps during integration
Shareholders/investors	Possible scale economies, synergies and stronger earnings capacity	Integration costs and uncertainty about timing of synergies
Government	Stronger PSBs & policy-delivery capacity	Complexity of large institutions integration cost
Regulators	Potentially stronger/common risk architecture	Greater operational and systemic complexity
Communities	Potentially wider financial inclusion	Branch rationalization may affect proximity

Organizational Challenges Created by Consolidation

First, integration costs can be substantial. Duplicate branches, overlapping managerial roles, incompatible processes and legacy technology may increase expenses before synergies emerge. Second, organizational culture can become fragmented when employees from different institutions bring different procedures and informal norms. Third, technology migration can create operational and cyber security exposure. Fourth, rationalization of physical and human resources can generate employee resistance and affect morale. Fifth, larger institutions require more sophisticated governance because managerial span, product complexity and geographical reach increase. These challenges correspond with the mixed evidence in the study, which found positive developments in management efficiency and earnings-related measures alongside weaknesses in several operating-expense and non-interest-income measures.

Contemporary Evidence on PSB Performance

Recent official evidence indicates that the post-consolidation PSB environment is substantially stronger than the period of severe asset-quality stress around 2018. According to the Government's 2025-26 annual report, PSB gross NPA declined from 14.58% in March 2018 to 2.58% in March 2025 and 2.30% on provisional September 2025 data. Net NPA declined from 7.97% in March 2018 to 0.52% in March 2025 and 0.45% in September 2025. PSB CRAR was 16.10% in March 2025 and 15.96% on provisional September 2025 data.

The same official source reports aggregate PSB net profit of Rs1.78 lakh crore for FY2024-25, while PSB global deposits and advances reached Rs146.27 lakh crore and Rs114.85 lakh crore respectively by September 2025. These developments demonstrate a marked strengthening of the sector, but they should not be attributed exclusively to mergers: recapitalization, resolution of stressed assets, prudential reforms, improved underwriting, economic conditions, digitalization and broader PSB reforms also contributed.

Table:3: A Contemporary Framework for Evaluating Merger Success

Dimension	Key indicators	Managerial question
Financial	ROA, ROE, net interest margin, cost-to-income, capital adequacy	Has scale translated into sustainable financial performance?
Asset quality	GNPA, NNPA, slippage, provision coverage	Has integration strengthened credit-risk management?
Operational	cost per transaction, branch productivity, employee productivity	Are duplicated processes and resources being rationalised?
Digital	digital adoption, uptime, straight-through processing, cyber incidents	Has the merger accelerated technology capability?
Human capital	training, attrition, productivity, engagement	Are employees adapting to the new organisation?
Customer	retention, complaints, turnaround time, digital satisfaction	Has the customer experience improved or deteriorated?
Governance & risk	risk-adjusted performance, compliance incidents, audit findings	Has organisational complexity remained controllable?
Strategic	MSME/retail reach, product diversification, market share	Has the combined bank developed new capabilities?

Future Research Propositions and Methodological Agenda

Scope and Limitations

The evidence base is primarily documentary and sector-level. Accordingly, the article does not estimate an independent causal merger coefficient or claim that every observed improvement in PSB performance resulted from consolidation. The selected official sources are appropriate for institutional

and sectoral evidence, but they do not by themselves capture bank-specific employee perceptions, customer-level service outcomes or branch-level integration costs. These limitations motivate future use of matched controls, bank-level panel data, employee/customer surveys and event-study designs.

Future empirical research should progress beyond simple pre/post mean comparisons. A stronger design would combine panel-data methods with difference-in-differences, matched comparison banks, event-study analysis for listed banks, efficiency estimation such as DEA/SFA, and dynamic risk measures. For organizational outcomes, survey evidence from employees and customers can be integrated with administrative indicators. Where sufficient observations are available, merger effects should also be separated from macroeconomic shocks, regulatory reforms and bank-specific restructuring. The study itself demonstrates the usefulness of paired comparisons but also reveals why a broader design is necessary. A contemporary study can retain these financial measures while adding organizational and digital dimensions.

Managerial and Policy Implications

Merger planning should be treated as a multi-year transformation programme rather than an accounting or legal exercise.

Technology integration should be governed through dedicated migration, cyber security, data-quality and business-continuity teams.

Human-resource integration should combine transparent communication, retraining, role redesign and competency-based deployment.

Management should measure synergy realisation separately from accounting performance so that cost savings and revenue gains can be attributed to identifiable integration initiatives.

Customer continuity should be treated as a board-level metric during system and branch integration.

Risk governance should be strengthened in proportion to the greater scale and complexity of the merged institution.

PSB performance assessment should combine financial soundness with productivity, service quality, digital capability, employee outcomes and resilience.

Future consolidation decisions should be evidence-led and institution-specific rather than based on size alone.

Make HR integration a formal merger work stream with measurable milestones.

Create transparent frameworks for seniority, promotion, transfer, posting and appraisal.

Use competency mapping to identify skill shortages and opportunities for redeployment/reskilling.

Provide continuous training in digital banking, analytics, cyber security, compliance and customer relationship management.

Research Novelty and Contribution :

The article contributes a strategic-management interpretation to the study of the six major Indian PSB mergers. Its contribution is not the assertion that mergers are not intrinsically beneficial, nor that sector-wide expansion proves merger success. Instead, the contribution is to reposition merger analysis around organizational transformation and capability conversion.

First, it progresses from transaction-level analysis to organization-level transformation, treating the merged bank as a redesigned organizational system. Second, it integrates financial consequences with organizational, technological, human-capital, customer and governance dimensions. Third, it unambiguously splits contextual sector recovery from merger-specific causal effects, thereby avoiding over-attribution. Fourth, it treats integration quality as a potential mechanism linking consolidation to performance rather than assuming a direct merger-performance relationship. Fifth, it introduces strategic adaptability and digital capability as contemporary dimensions of merger performance, reflecting the transformation of banking after 2017.Sixth, it translates the six mergers into a consistent strategic-management case of scale creation, capability integration and institutional transformation rather than treating each merger only as a financial episode.

Conclusion

The contemporary meaning of bank merger in India has expanded from the traditional logic of rescuing weak institutions to a broader agenda of organizational transformation, scale creation, technological modernization and competitive capability. The post-2017 PSB consolidation programme must therefore be evaluated as a business-and-organization transformation rather than simply as a merger of balance sheets. Recent official data show substantial improvements in PSB profitability, asset quality and capital adequacy, while the reform architecture explicitly emphasizes governance, prudential lending, risk management, technology/data and outcome-centric HR.

The impact of Indian PSB mergers extends well beyond consolidation of assets and liabilities. Employees are central because they implement the new technology, processes, risk controls and customer-service model. Formal employment protection provides an important institutional foundation, but effective integration also requires fair career systems, cultural integration, reskilling, transparent deployment, employee participation and workload management. From a contemporary business and organizational perspective, the key issue is not simply whether a merger creates a larger bank, but whether the enlarged organization can convert scale into capability. The sustainable outcome depends on integrating people, processes, technology, governance and customer relationships.

The principal contemporary lesson is that scale is an enabling condition, not an outcome. The lasting value of consolidation depends on whether larger institutions can convert scale into lower transaction costs, stronger risk management, better digital capabilities, more productive human capital, improved customer experience and sustainable strategic competitiveness. This provides a stronger basis for evaluating Indian PSB mergers in contemporary business and organizational research.

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RESEARCH ARTICLE

A Systematic Review on the Impact of Financial Innovation on Bank Profitability: Evidence from Commercial Banks in Ethiopia

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ABSTRACT

This systematic literature review analyzes the effect of financial innovations on bank profitability in Ethiopia, highlighting research gaps, evaluating existing studies, and offering guidance for future research. It examines 25 scholarly articles published between 2013 and 2023, selected using open-access resources like Google Scholar, JSTOR, and Emerald, due to limited studies and access to established databases. Employing the PRISMA framework, the review applied specific inclusion and exclusion criteria to identify relevant studies. Descriptive analysis and citation analysis were used to evaluate various parameters and identify influential works. The findings reveal notable inconsistencies in the variables examined across studies, with contradictions both within and compared to earlier research. Most studies considered only a narrow set of variables and had limited citation impact. Furthermore, theoretical frameworks often misaligned with findings, and results were inadequately supported. The review calls for comprehensive research into financial innovations and their effect on bank profitability, urging stakeholders to address inconsistencies, explore critical variables, and adopt robust theoretical frameworks. Future studies should strive to provide clearer, more conclusive insights into this critical area.

Keywords: Financial innovation, Ethiopia, profitability, banks, Systematic

Introduction

The modern world is changing quickly and profoundly, and innovation is becoming more and more significant in every area of the international economy. Businesses can implement new and improved methods, increase their competitiveness, and efficiently adapt to shifting market needs thanks to innovation. One industry where this trend is especially noticeable is the financial sector, where financial institutions consistently implement cutting-edge goods, services, technologies, and procedures to adjust to the shifting market conditions and satisfy shifting client demands (Reshid, 2020).

The financial system in every economy is made up of the financial markets, where investors join directly through ownership of securities, and the bank-based system, where provision and monitoring of investment funds are made through the banks. Banks act as intermediaries by collecting savings from customers and then lending the money to firms or individuals who are looking to invest (Temam, 2018). A commercial bank must innovate by designing, developing, and implementing new procedures, products, and technologies to remain competitive. These innovations include services such as online banking, mobile banking, agency banking, electronic fund transfers, ATMs, debit cards, and other similar offerings (DeYoung, Lang W., & Nolle D., 2007).

The contemporary financial system is characterized by a rapid pace of innovation, both in scale and value. While numerous studies have recently explored this topic, most have focused either on the global financial crisis or on specific types of financial innovations. Additionally, these studies often lack a unified definition of financial innovation and a consistent framework for categorizing its various forms (B. Joanna, 2011).

Financial innovation has been both lauded and criticized for its dual role as a driver of societal progress and a contributor to economic fragility (Josh Lerner & Peter Tufano, 2011). While it is often associated with benefits such as enhanced profitability, improved management efficiency, business growth, and other positive outcomes, financial innovation also comes with drawbacks. These include heightened risks to the banking sector, increased occurrences of fraud, the introduction of moral hazards, higher operating costs, and disruptions caused by technological failures, leading to inconvenience and revenue losses (Wairagu Githakwa, 2011) Therefore, it is essential to examine the growth of various innovations, particularly financial innovations, and their impact on a country's financial system.

Financial innovation can be defined as the development and dissemination of new financial instruments, financial technologies, institutions, and markets in the financial system in order to overcome the system's deficiencies (Frame & White, 2004; Josh Lerner & Peter Tufano, 2011).

In the same way, Iman also defines financial sector innovation as the introduction of a newer or better product and procedure that lowers the cost of generating already-existing financial services or transactions (Iman, 2011). Financial innovation, broadly stated, is the process of creating and then making popular new financial instruments, financial technologies, institutions, and markets (Satya Sekhar, 2018).

According to Lazo & Woldesenbet, and Gorton & Metrick, the growth of modern financial innovation can be attributed to various factors, including lower bankruptcy costs, tax benefits, a decrease in moral hazard, lower regulatory costs, increased transparency, and customization (Lazo & Woldesenbet, 2006; Gorton & Metrick, 2010). The use and advancement of financial innovation in Ethiopian commercial banks are driven by a number of factors. These driving forces, according to Girma (2016), are the need to enhance performance, the need to enhance the relationship with customers, the rapidly changing needs and preferences of customers, the need to enhance organizational performance, the desire to cover a large geographic area, the desire to enhance organizational reputation, and the desire to lower transaction costs (Girma, 2016).

In the same manner, Kinfe also argues that the use and development of e-banking technology are also driven by increased competition among banks to grow or retain their customer base. From the perspective of the banks, implementing e-banking services provides advantages such as luring high-value clients, improving brand recognition, expanding customer reach, increasing organizational efficiency, and reducing workload, among others (Kinfe, 2016).

Despite the importance of financial innovation in demystifying bank profitability, the influence of innovation on financial performance is still poorly understood for the following primary reasons: First, there is a lack of understanding of the drivers of innovation, and second, innovations impact on banks financial performance has not yet been extensively examined (Mabrouk & Mamoghli, 2010).

Previous studies research on the effect of financial innovation on performance has yielded empirically mixed results and conflicting findings. While some studies found a positive effect, some found a negative one, while other researchers came to conflicting results (Catherine & Herick, 2016; MALHOTRA & SINGH, 2009; Lazo & Woldesenbet, 2006; Lerner, 2006; Chimwemwe & Moses, 2018; Worku, 2016).

From prior empirical literature, it is clear that there is no strong evidence about how financial innovation affects bank performance. A new investigation on the topic is required in light of the conflicting findings and conclusions.

Generally, it reveals that there is a conflicting evidence regarding whether financial innovation is beneficial or detrimental to the financial industry (Beck, Tao , Chen, & M., 2016). Regardless of the conflict, in Ethiopia no work to date has examined the relationship between financial innovation and the growth and stability of banks from a comprehensive perspective.

Without an effective financial system, which is described as the set of markets, institutions, instruments, and laws used to determine interest rates, trade financial securities, and produce and deliver financial services globally, the modern economy would not be possible (Polański, Pietrzak, & Woźniak, 2008; Rose & Marquis, 2009). The financial system is recognized as one of the most fundamental innovations of contemporary society and is defined as an integral component of the financial activity and, consequently, as a key component of the social system (Polański, Pietrzak, & Woźniak, 2008). But unlike the developed nation's financial system which is the different collections that make the effective financial system, the Ethiopian financial system is bank based system.

Therefore, the primary goal of this literature review is to explore and evaluate studies that investigate the effect of financial innovations on the profitability of Ethiopian banks. Additionally, the review identifies research gaps, assesses the depth and quality of existing studies in the field, and offers guidance for future research. To achieve this objective, the review addresses the following questions: How do financial innovations influence the profitability of Ethiopian commercial banks? What is the scope and quality of the existing literature in this area?

2. Methodology

This systematic review of empirical studies examines the impact of financial innovation on bank profitability in Ethiopia. Google Scholar was the primary database used, being a widely accessible academic search engine that encompasses a broad spectrum of scholarly publications relevant to the Ethiopian banking sector. The studies reviewed in this study are from 2013 to 2023. These studies were selected to include the evolution of empirical studies on the effect of financial innovation on bank profitability after the introduction of electronic banking payment systems in Ethiopia in 2001 (Worku, 2010; Ashenafi, 2019; Aschenek, 2020).

We used a systematic literature review (SLR) methodology to identify, screen, assess and synthesize the existing empirical evidence. The review was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework to improve the transparency, consistency, and reproducibility of the review process. PRISMA was appropriate as it provides a systematic approach to reporting how studies were identified, screened, assessed for eligibility and finally included in the review. The researcher can also clearly report the number of records identified, duplicates removed, studies excluded, and studies retained for final analysis. This reduces the possibility of selecting studies arbitrarily and enhances the dependability of the synthesis of evidence.

Thus, the review was conducted following the main PRISMA stages: identification, screening, eligibility assessment, and inclusion. Studies were selected based on a pre-established inclusion and exclusion criteria, including relevance to financial innovation and bank profitability in Ethiopia, publication within the specified time frame, and availability of sufficient scholarly information for analysis. Thereafter, the last eligible studies were analyzed to identify the dimensions of financial innovation investigated, the methodological approaches used, the measures of bank profitability and the relationships between financial innovation and bank profitability reported.

A systematic review is a method used to compile, evaluate, and communicate the findings and significance of a large body of research. Its goal is to offer a comprehensive summary of the existing literature related to a specific research question. The systematic review approach is structured to minimize the risk of bias, which can arise in other types of review methods (Bimrose J. Brown J. and Barnes S.A., 2005).

In the same manner, Okoli asserts that a systematic review allows us to chart the landscape of how financial innovation affects the profitability of commercial banks in Ethiopia, while also identifying gaps from a broader viewpoint by methodically summarizing and synthesizing insights from previous research (Okoli, 2015). It is also described as a particular approach for identifying relevant studies, selecting and assessing contributions, analyzing and synthesizing information, and presenting evidence in a way that enables clear and trustworthy conclusions about the topic being examined (Denyer & Tranfield , 2009).

Tranfield, Denyer, & Smart state that the reviewer defines the appropriate research sequences for the study. The seeking strategy is reported in sufficient detail to ensure the research to be replicated (Tranfield , Denyer , & Smart, 2003). The research result should consist of a complete list of papers used in the review, with only those studies meeting the inclusion criteria outlined in the review protocol being included. The review process involves the following key steps:

The first step is to assess the strengths and weaknesses of each database (Database evaluation). However, challenges arise as databases like Scopus and Web of Science are not freely accessible. Additionally, other databases such as PubMed, DOAJ, EBSCO, IEEE Computer Society, ISI Web of Knowledge, and ACM Digital Library do not contain relevant research articles on the subject. The lack of well-established databases for business and economics presents a major hurdle for conducting a thorough systematic review.

The second step involves reviewing published articles on the concept of financial innovations within the relevant databases (Article exploration).

The third step is to categorize the obtained articles using logical codes (Article categorization). These categories help in forming a framework for understanding the subject matter.

The fourth step is to present the major findings using the logical codes, based on the observations generated from the framework (Presentation of findings).

The final and most crucial step is to identify gaps in existing research, providing avenues for future studies (Identification of Research gaps).

The inclusion criteria (IC) defined for this review focus on the effects of financial innovations on the profitability of commercial banks, specifically within the context of commercial banks in Ethiopia. The documents reviewed are required to be in English. Given the lack of well-established, freely accessible databases, the search for relevant studies was conducted using open access search engines and databases such as Google Scholar, JSTOR, Emerald, Google, and Semantic Scholar. For the systematic review, only publicly available, published results from peer-reviewed journals, books, conferences, workshops, or theses are considered as part of the peer-reviewed results.

In addition, various keywords were employed to locate studies primarily focused on the impact of financial innovations on the profitability of banks in Ethiopia. Using terms such as financial innovations, e-banking, Ethiopia, the effect of financial innovations, and financial technologies, a total of 37 studies on this topic were identified. Of these, 22 studies were located through database searches, while the remaining 15 were found through other records from different sources. After removing duplicates, the final count of records was 37.

After conducting a search for studies on the impact of financial innovation in Ethiopia, 27 studies were found to examine its effect on the profitability of commercial banks in the country. The other 10 studies were excluded as they fell outside the scope of the review. Consequently, 10 studies were removed during the screening process because they were not relevant to the topic and focused on different cases or issues.

The evaluation primarily focuses on the impact of financial innovation on the profitability of commercial banks in Ethiopia. A total of 27 studies conducted on commercial banks in Ethiopia were selected based on an eligibility quality assessment. However, two of these 27 full-text studies were excluded from the review as they did not meet the eligibility criteria.

A final sample of 25 research papers was selected from the search engines based on the established inclusion and exclusion criteria for classification and analysis (see Figure 2.1).

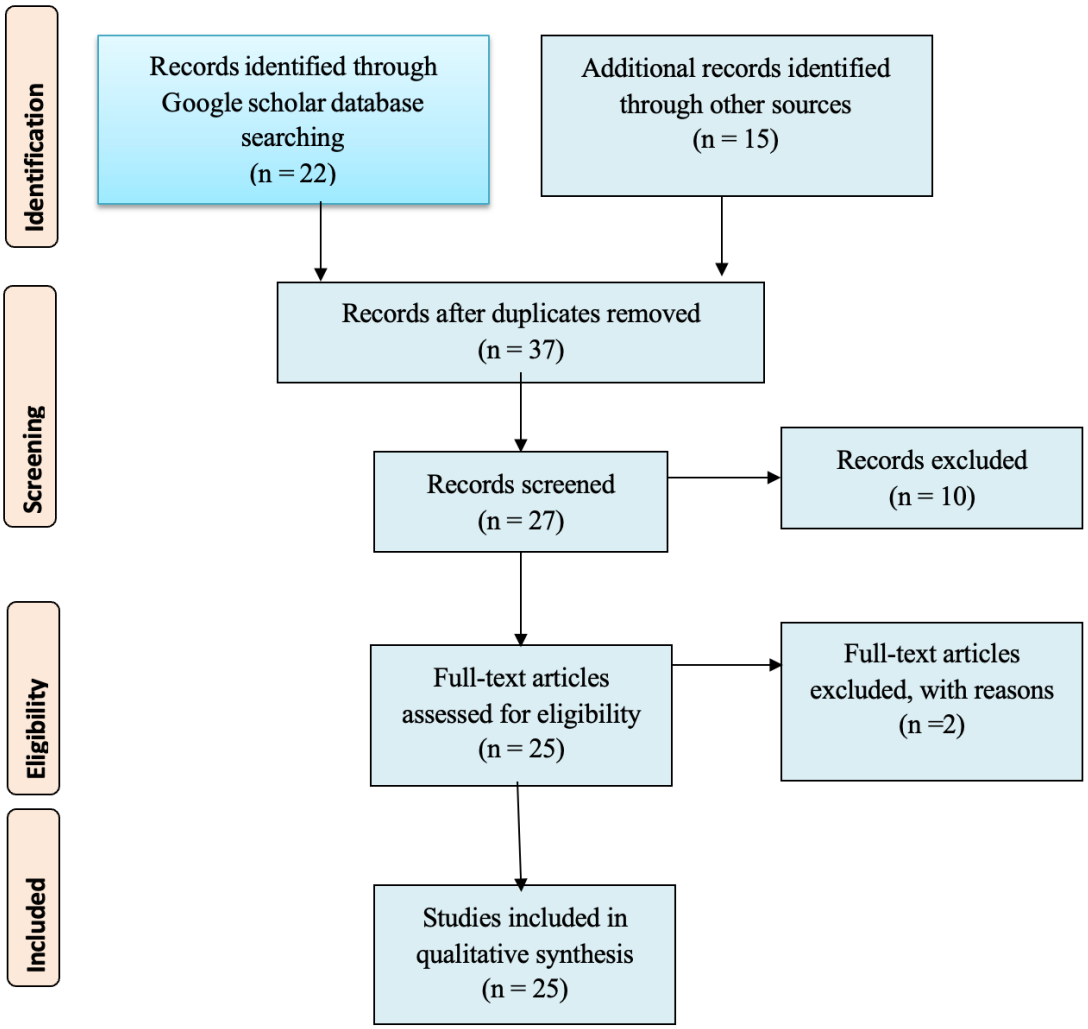

Figure: 2. 1: The article selection process for the Systematic literature review using PIRSMA framework

Classification of the Studies

Classification plays a crucial role in systematization, as it helps identify the key characteristics of the papers being reviewed. The studies that met the criteria for inclusion in this systematic review were examined in terms of their research outlets. After the selection process, the review categorized the relevant studies using various parameters to gain a clearer understanding of the research conducted on the impact of financial innovations on bank profitability.

To evaluate and integrate the findings from the existing research, all selected articles were carefully organized, and a systematic review of the existing literature was conducted based on the following parameters:

1. Theories related to the studies:

Schumpeter Theory, Constraint-induced financial Innovation Theory, Transaction Cost Innovation Theory, Location Innovation Theory, Task Technology Fit (TTF) Theory, Innovation Diffusion Theory, Financial Intermediation Theory, Regulation Innovation Theory, Theory of Planned Behavior, Christensen's Theory of Disruptive Information and Strategy Jobs-To-Be-Done Theory.

2. Methodology: Quantitative Research, Qualitative Research, and Mixed research.
3. Variables of interest:

Number of ATM Terminals, Number of Mobile Banking users, Number of Agent Banking, Number of Debit cardholders /users, Number of internet banking users, Number of point of sale terminal (POS), Number of New Saving Account, Hard ware investment, Software investment, IT service investment, Information and Telecommunication Technology (ICT), Electronic fund transfer, Credit card, Agency banking, Product innovation, Process innovation, Market innovation, Technological innovation.

4. Citation: a. Cited b. Not cited
5. Databases used: Google scholar, Google, and others
6. Types of the paper: Published articles, and MSc thesis (Unpublished)

3. Result and Interpretation

This section presents and discusses the key findings from the systematic review. A total of 25 papers were analyzed to identify knowledge gaps regarding the impact of financial innovations on the profitability of commercial banks in Ethiopia. The Google Scholar search engine was primarily used to locate studies examining this relationship. A descriptive analysis was conducted, and the literature was categorized based on various criteria for clearer presentation. The analysis focuses primarily on studies conducted in Ethiopia that explore the effect of financial innovations on bank profitability.

Descriptive Analysis

A descriptive analysis of twenty-five studies was conducted in order to determine the basic ongoing trend of publication on the effect of financial innovations on the profitability of Ethiopian banks. To answer the research question, the review analyzed the publication trend in terms of total publication by year, theories employed, variables of interest, the types of papers, the databases used, the methodology used, and citations.

Year Wise Publication

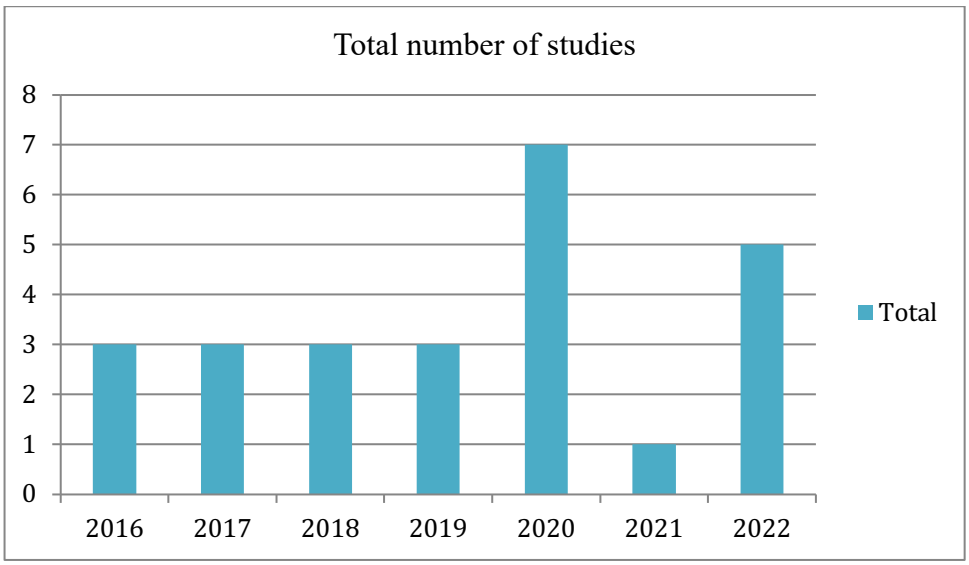

Figure-1 Studies frequency

The year-wise publication provides the trend of literature on the effect of financial innovation on bank profitability based on the publication frequency in terms of the year.

Figure 1 depicts that the year-wise distribution frequencies of the studies of the effect of financial innovation on the profitability of banks in Ethiopia are uniform from the years 2016 to 2019. The highest number of studies was conducted in 2020 and 2022. Before the year 2016, there were no studies conducted in Ethiopia on the effect of financial innovation on Ethiopian banks profitability that were published and freely accessible.

Types of the paper

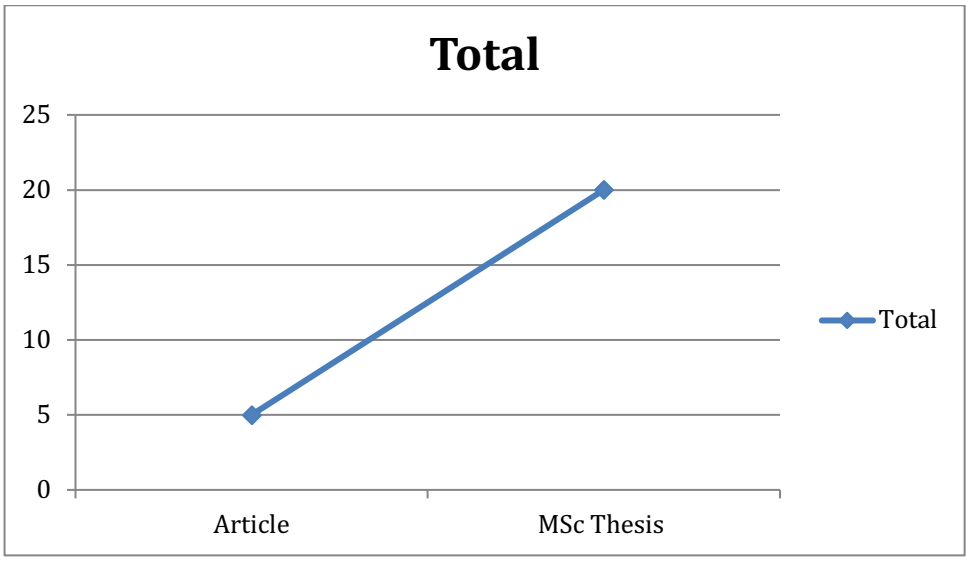

Figure 2 types of the studies

As shown in Figure 2, the studies included in the review were 80% MSc theses (20 studies) and 20% (5 studies) published journal articles. This divergence between published and unpublished research suggests that a significant share of the empirical evidence available on the link between financial innovation and bank profitability in Ethiopia comes from postgraduate research and not from peer-reviewed journal publications. The relatively low proportion of published articles also indicates that whilst the subject has attracted significant interest among postgraduate researchers, the results have been less widely disseminated via peer reviewed academic journals.

Methodology

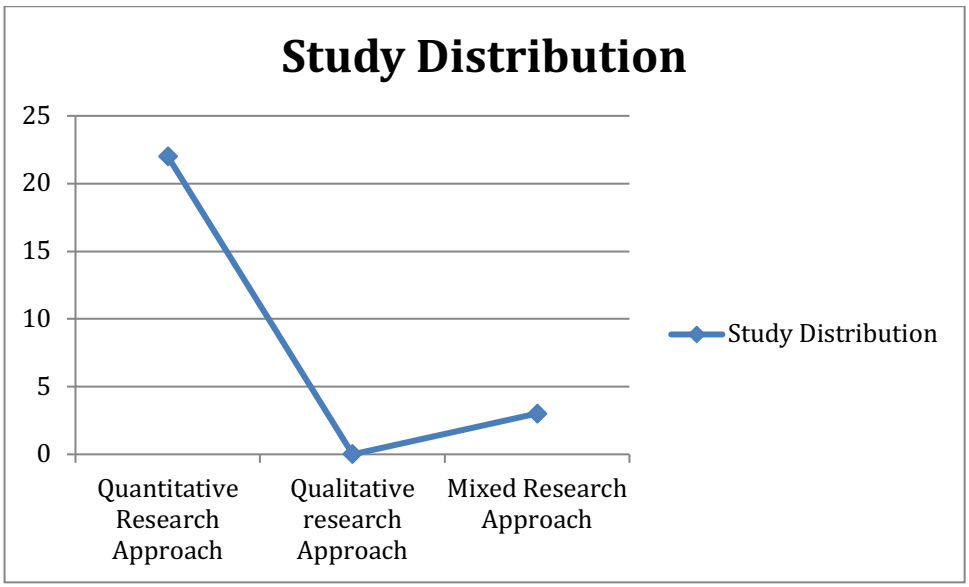

Figure 3: Methodology employed

In general, figure 3 reveals the study distribution of the methodology: a mixed research approach was highly employed next to a quantitative research approach, whereas no study solely employed a qualitative research approach to study the effect of financial innovation on bank profitability.

Databases

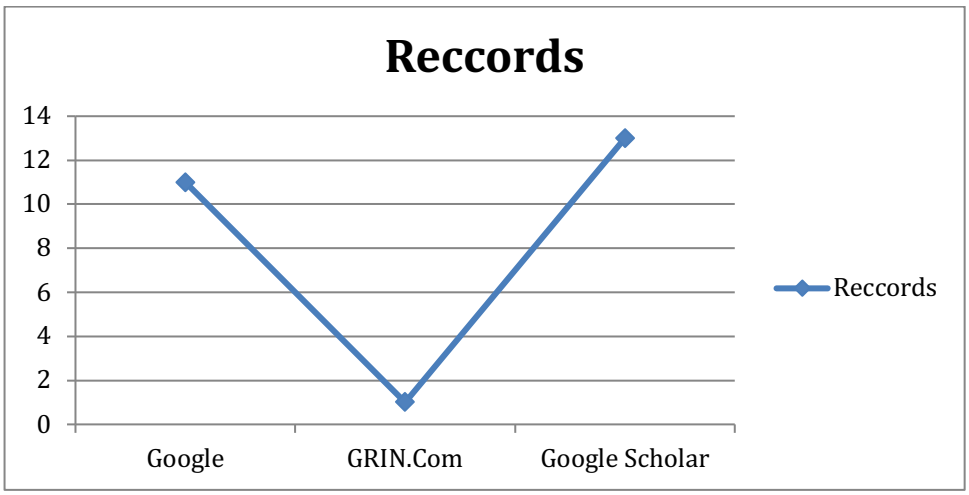

Figure 4 Sources of the data

Concerning the sources of data, figure 4 shows that the majority of the data was obtained from the Google Scholar search engines and Google.

Theories used/ backed

Number of studies that uses theory or not

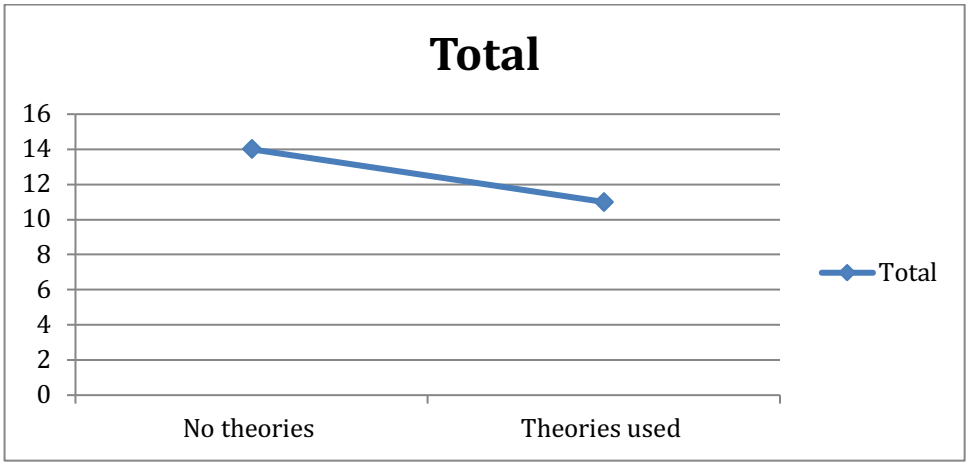

Figure 5 Usage of theories

From all studies employed, 11 studies used the subject-related theories, whereas the remaining 14 studies didn't use the theories related to financial innovation, which may help the paper analyze and forward sound conclusions and recommendations.

List of the theories employed

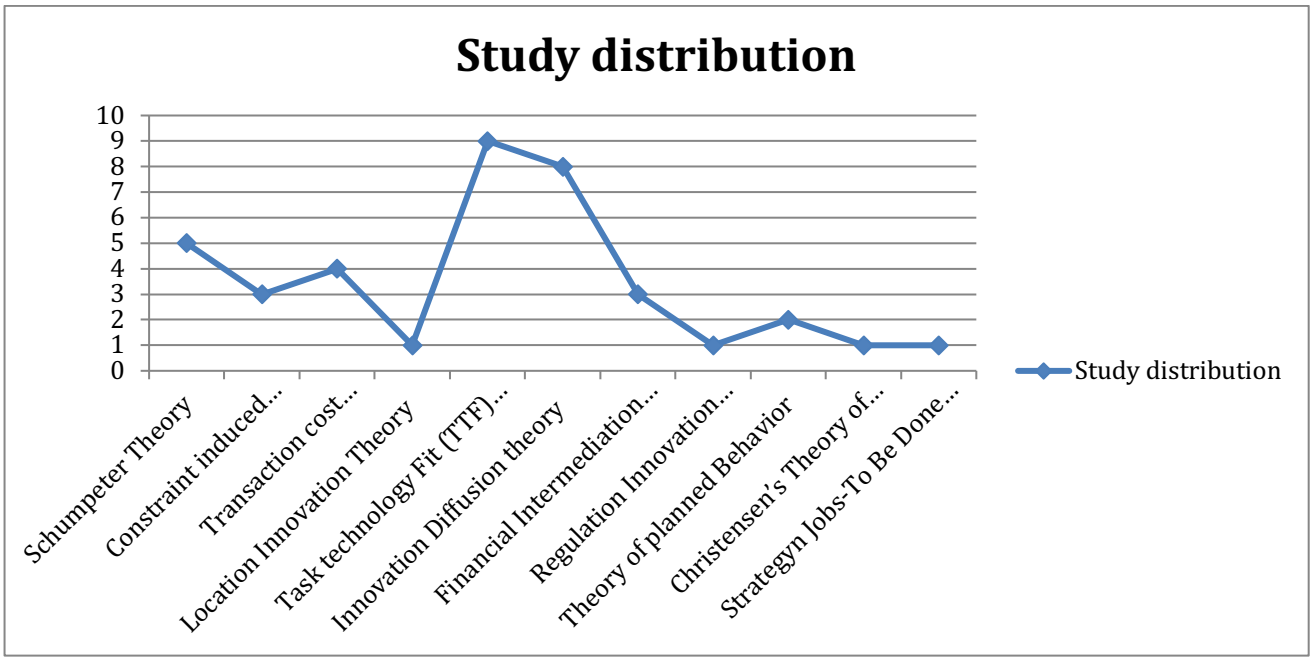

Figure 6: Frequency of theories backed in the study

The objective of this review is to show the effect of financial innovation on bank profitability and describing the applicability of financial innovation theories in the present banking environment and identify the most accepted theory as per the studies under review.

Figure 6 depicts that from all 11 theories stated in the paper under review, task technology fit (TTF) theory, and innovation diffusion theory were relatively used in the paper. It indicates that there is a marked predominance for task technology Fit (TTF) theory (9 paper), and Innovation Diffusion theory (8 papers), which deals with the concept of financial innovation, followed by Schumpeter Theory (5 studies), and Transaction cost Innovation Theory (4 studies). The rest of the theories were used in few studies.

Citation Analysis

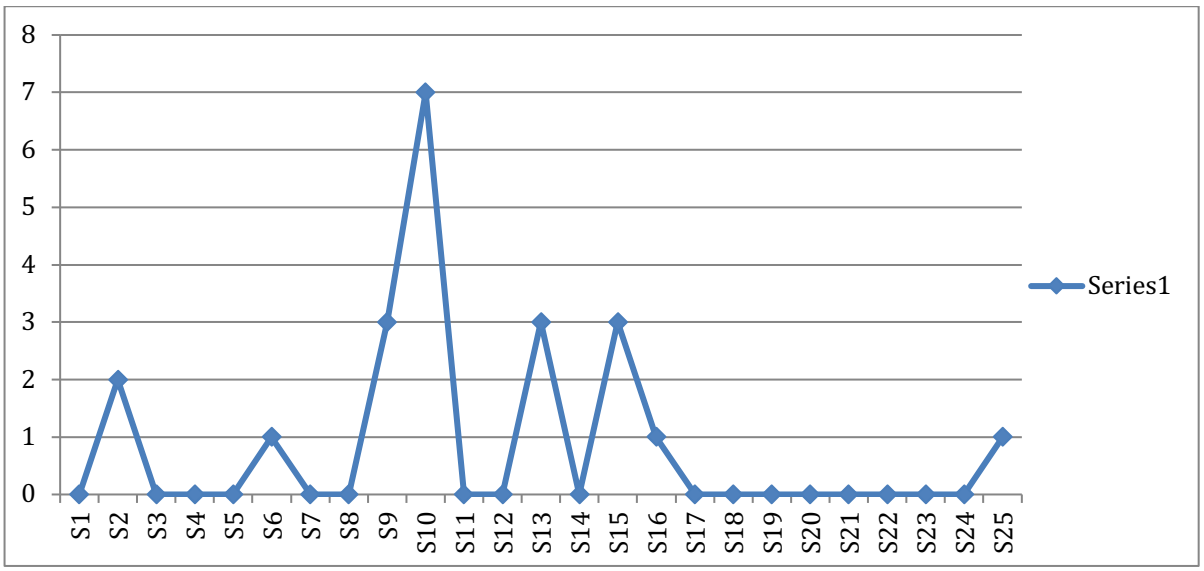

Figure 7: Citation Analysis

Figure 7 shows that, of the 25 studies reviewed, only 8 studies had received citations, while the remaining 17 studies had not been cited. Study 10 was comparatively the most frequently mentioned study. This result suggests that scholarly attention and distribution of studies on financial innovation and bank profitability in Ethiopia have been scarce. The large percentage of uncited studies also points to the need for more research, publication, and accessibility in order to create a more robust and cohesive body of evidence.

Variables of interests

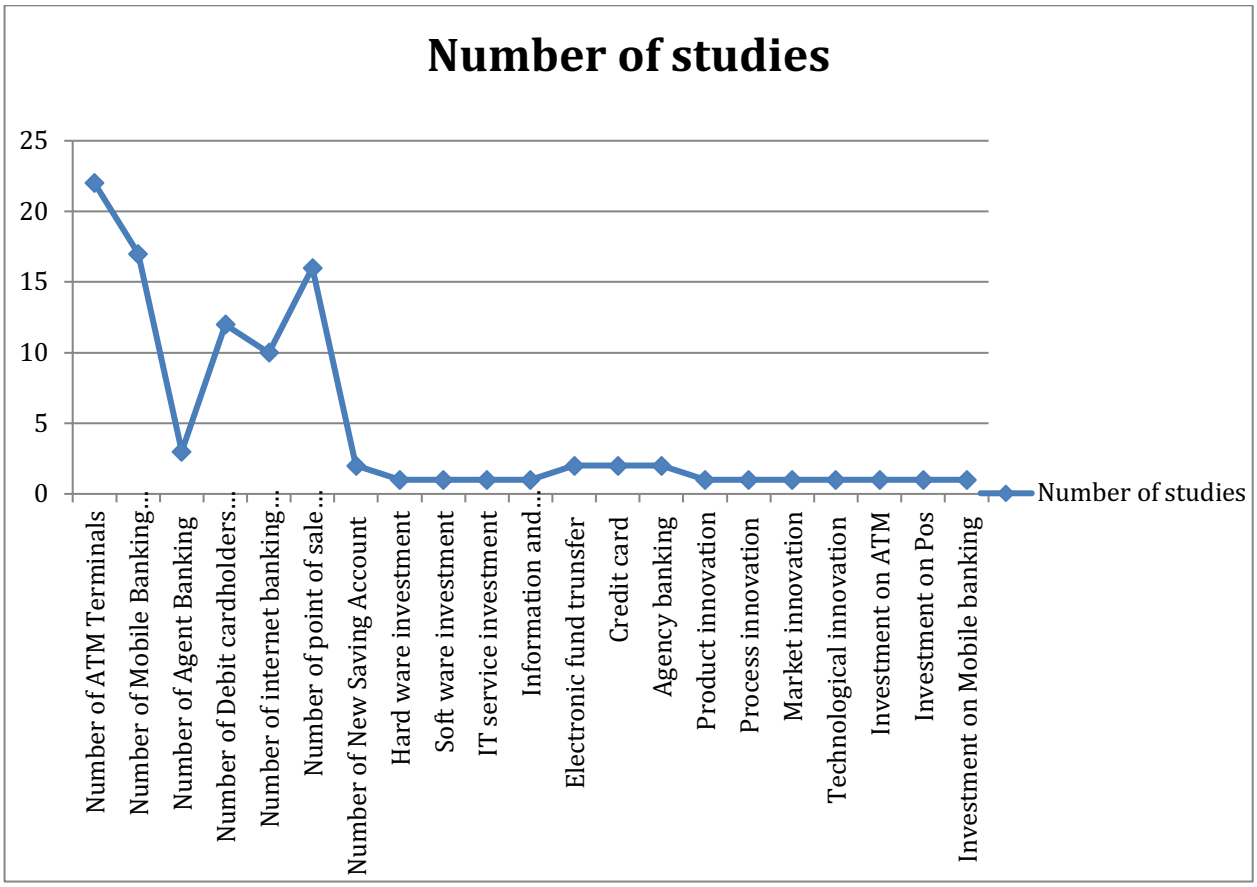

Figure 8: variable of interest

In Figure 8, it is observed that different variables were used in the studies in relation to the topic. The figure reveals that the first variables of interest highly explored were the number of ATM users, number of mobile banking users, number of debit cardholders or users, number of internet banking users, and number of point of sale terminals (POS), which were used in the majority of the study under review. On the other hand, the other variables were the variables of interest investigated and used in one or two studies from the sampled paper under review.

4. Discussions

The modern financial system is distinguished by a rapid rate of innovation, both in terms of quantity and value. As a result, it is critical to assess their effect on the financial institutions profitability. Many studies on this topic have recently been published; however, they have primarily focused on the global financial crisis perspective or on a single type of financial innovation (B. Joanna, 2011).

The modern economy cannot exist without an efficient financial system, which is defined as a collection of markets, institutions, instruments, and regulations that enable financial securities to be traded, interest rates to be determined, and financial services to be produced and delivered globally (Polański, Pietrzak, & Woźniak, 2008; Rose & Marquis, 2009). The financial system is regarded as one of contemporary society's most important creations, and it is described as an integrated aspect of the economic system, and thus a key part of the social system (Polański, Pietrzak, & Woźniak, 2008).

Companies have recently placed a greater emphasis on innovation. This is due to the fact that differentiation will provide them with a competitive advantage. Companies who develop innovative products or services have an advantage, and this advantage is growing in the face of competition (Akkaya, 2018). Innovation gives companies the chance to adapt to the environment they are in. More importantly, it enables them to recognize and control change in the external environment, which is critical for the operator's long-term competitiveness. Innovation can achieve firm’s short term outputs such as increased financial performance and market share, creation of new markets, reduction of production costs.

Therefore, this paper is tries to explore the studies conducted in Ethiopia on effect of financial innovation on banks profitability and analyzes the literature review to systematize the current state of knowledge on the financial innovations of the banking industry. The paper examines existing research on the subject of financial innovations and their effect on bank profitability in Ethiopia.

Citation analysis

Along with the aforementioned analysis, a citation analysis of the sample of articles is performed to identify influential authors and their papers in financial innovation and bank profitability research. A citation shows the relationship between the cited item and the citing document. Citation analysis is a method for gathering pertinent studies; it aids in locating the most significant studies pertinent to the task at hand, and serves as a standard measurement because high citation scores are related with article quality (Kumar, Colombage, & Rao, 2017).

First, the total number of citations for each paper was obtained from Google Scholar and ranked. Second, in order to determine the number of citations for an article, the citation analysis was used, and the descriptive analysis shows the total number of citation scores, i.e., the total citation score per study. Figure 7 depicts the total number of citations for each of the 25 sampled papers.

According to the citation analysis (Figure7), Abebe, was the most referenced author in the effect of financial innovation on Ethiopian bank profitability from 2013 to date (Abebe, 2016).

According to the findings of this research, only 8 of the 25 studies were cited, while the rest 17 were not. This indicates how little research has been done in Ethiopia on the effect of financial innovations on bank profitability. The year wise distribution of the research reveals that, with the exception of 2020 and 2022, which have the biggest number of studies, the frequency of studies on the influence of financial innovations on bank profitability remains steady from 2016 to 2019. Between 2013 and 2015, there were no published studies on the effect of financial innovation on bank profitability in Ethiopia. Even within the overall number of studies reviewed, 80% were MSc theses (unpublished) and the remaining 20% were published articles, revealing how much research relating to the issue was conducted in Ethiopia. Similarly, Ding and Cronon believe that the citation depicts the relationship between the cited and citing articles. Citation analysis determines the prominence and influence of an article in the scientific community by counting the number of times it is referenced in other works (Ding & Cronin, 2011). As a result, we may infer that, despite the fact that financial innovation in Ethiopia began in 2001, the effort has been very weak and unsatisfactory.

Only eight of the studies under consideration were cited, (Temam, 2018; Altaseb, 2020; Yasin, 2018; Abebe, 2016; OMER, 2020; Damtew, 2016; BEZA, 2017; Worku S. , 2016) while the remaining seventeen were not. The analysis suggests that the publishing pattern indicates that the area is under-researched and the quality of the studies is poor.

Variables of Interest

Ongoing improvements and changes in the current form of existing financial products produce efficiency in the financial system; thus, constant change or innovations in financial institutions are crucial and have recently grown (Berman, Cano-Kollmann, & Mudambi, 2022).

As a result, the link between financial innovations and economic growth has attracted the interest of scholars and policymakers throughout the years, particularly during the 2007 financial crisis, given the ambiguity around its negative impact on the economy (Li & Xu, 2021).

When the financial system continues to develop, the economy benefits because it makes it easier to accumulate wealth and encourages saving while also providing a variety of options in the form of new and improved financial products that are more useful and less expensive (Lusardi, 2019).

Financial innovation is a continuous and quick process that comprises the development of new financial goods, services, and processes in response to changing market demands and the enhancement of current ones. The financial system is continually changing and transforming as a result of this innovation to accommodate new products and technology. Financial innovation is critical because it opens up new avenues for accessing financial services and managing risk (Chien, Pantamee, Hussain, Chupradit, Atif Nawaz, & Mohsin, 2021; Djoumessi, 2009; Donner & Tellez, 2008).

Financial institutions, particularly private commercial banks, play an important role in the growth of the financial system through developing various financial goods and services. In the long run, these innovative products and services contribute to faster economic growth by enhancing numerous economic activities and facilitating financial inclusion, money transfer, and remittances (Edquist, 2019).

These expanded economic activities offer more opportunities, which contribute to higher economic growth. Financial innovations in the economy evolve in conjunction with the financial system. As a result, the financial system improves in efficiency, allowing financial firms to offer better products and services.

In Ethiopia, few studies have been conducted on the topic of financial innovations and bank profitability (Worku S. , 2016; Abebe, 2016; Berhan, 2018; Mezgebu, 2017). Many of these studies

embrace more or less focuses on similar variables of interest and the results are contradicting with each other. For example the number of ATM terminals, the number of mobile banking users, the number of debit cardholders, number of internet banking users, and number of point of sale are the more explored variable of interest in the study under review. The review result reveals that these variables have a positive association with bank profitability, but there are also some studies where these variables indicating a negative relationship and no relationship at all (Fentaw & Thakkar, 2022; Temam, 2018; Reshid, 2020; Altaseb, 2020; Aschenek, 2020; Ashenafi, 2019; Damtew, 2016; Girma, 2016; Kinfe, 2016; Yasin, 2018).

It can be seen from the descriptive analysis of the variable of interests that a number of variables were employed as explanatory variables in the research pertaining to the subject the effect of financial innovation on bank profitability in Ethiopia.

The study shows that the number of ATM users which was employed in almost all studies, is the first variable of interest that has been thoroughly investigated. The second variable of interest thoroughly explored in the effect of financial innovation on bank profitability were includes the number of Mobile banking users, the number of debt card holders, number of internet banking users, and number of point of sale. In contrast, the other variables were rarely explored.

Theories backed

Several theories have been designed by different scholars to explain financial innovation. In determining the performance and profitability of the bank service employing high technology devices and machines there are different significant financial theories (Damtew, 2016).

The main purpose of this review was to indicate the effect of financial innovation on bank profitability of Ethiopian commercial banks, describe how financial innovation theories apply in the current business environment, and identify the most widely accepted theory according to the studies under review.

Schumpeter theory, constraint-induced financial innovation theory, transaction cost innovation theory, location innovation theory, task technology fit (TTF) theory, innovation diffusion theory, financial intermediation theory, regulation innovation theory, theory of planned behaviour, Christensen's theory of disruptive information, and strategy jobs-to-be-done theory were the theories used in the studies under evaluation, as indicated by the descriptive analysis (figure 6).

As a result, the descriptive analysis indicates that relatively there is a marked predominance for task technology fit (TTF) theory (9 studies), innovation diffusion theory (8 studies), and Schumpeter theory (5 studies).

The findings from the studies suggest that, with the exception of one, none of the studies identified a theory that is more applicable to the Ethiopian banking sector, nor did they establish a clear connection between financial innovation theories and their research. In contrast, Fentaw & Thakkar argue that the theories they examined confirm that financial innovation positively impacts the profitability of commercial banks. Their findings align with the concepts of Schumpeter's innovation theory, transaction cost innovation theory, constraint-induced financial innovation theory, and task-technology fit theory, all of which support the view that financial innovation positively influences the profitability of commercial banks (Fentaw & Thakkar, 2022).

While the review seeks to enhance understanding of financial innovation and bank profitability by examining the variables influencing profitability and identifying relevant financial innovation theories for commercial banks in Ethiopia, it makes limited progress in advancing empirical literature on financial innovation, particularly in terms of determining the significance of country-specific factors.

The findings of the research, along with the theoretical foundations, were inconsistent, unclear, and contradictory.

5. Conclusion

This study presents a systematic literature review on the impact of financial innovation on bank profitability in Ethiopia. The aim is to explore how financial innovation affects profitability, critically assess existing studies, identify research gaps, and offer directions for future research. A review of relevant academic publications from 2013 to 2023 was conducted to understand the focus on financial innovation's effect on bank profitability. The descriptive analysis, based on factors such as year-wise distribution, citation analysis, key variables, and underlying theories, provided valuable insights into the major contributions to the topic under investigation.

According to the citation analysis, only eight out of the twenty-five studies reviewed have been cited, while the remaining seventeen have not been referenced. This suggests that research on the impact of financial innovations on bank profitability in Ethiopia is limited, and the publishing trend reveals that the field is under-explored with low-quality studies. The result also suggests that scholarly attention and distribution of studies on financial innovation and bank profitability in Ethiopia have been scarce. The large percentage of uncited studies also points to the need for more research, publication, and accessibility in order to create a more robust and cohesive body of evidence. Many of the studies share similar variables of interest, but their findings are inconsistent. Additionally, when it comes to the theories used, the data shows that, except for one study, none of the research identified appropriate theories for the Ethiopian banking sector or linked financial innovation theories to their analysis.

6. Future Suggestions

Due to the limited and conflicting studies on the impact of financial innovation on bank profitability in Ethiopia, the existing research lacks solid foundations for drawing policy conclusions or guiding academics and researchers. Therefore, it is recommended that further investigations on this topic be conducted to provide more reliable insights. The Ethiopian banking literature has yet to give adequate focus to financial innovation and its relationship with bank profitability. There remains confusion regarding how financial innovation influences profitability and which factors contribute to its success. Consequently, it is advised that the relevant authorities undertake a thorough study to identify the key factors affecting financial innovation and bank profitability.

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RESEARCH ARTICLE

When Leaders Understand: The Influence of Empathetic Leadership on Employee Engagement, Psychological Safety and Performance

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ABSTRACT

Empathetic leadership has attracted growing attention as organizations explore leadership approaches that strengthen employee relationships, motivation, and performance. However, the mechanisms through which leader empathy translates into workplace outcomes remain insufficiently integrated. This conceptual paper develops a framework that explains the influence of empathetic leadership on employee psychological safety, engagement, and performance. Drawing on social exchange theory and job demands-resources theory, the paper synthesizes contemporary and foundational literature across leadership, organizational behavior, and workplace psychology. Four propositions are developed. The framework proposes that empathetic leadership enhances psychological safety of employees by reducing perceived interpersonal risk and communicating concern, understanding and support. It further argues that empathetic leadership strengthens employee engagement when employees feel safe psychologically. Greater engagement is subsequently expected to contribute to improved employee performance. The resulting sequential pathway is conceptualized as empathetic leadership → psychological safety → employee engagement → employee performance. The paper contributes to the leadership literature by integrating previously fragmented streams of research and identifying psychological safety and employee engagement as key mechanisms linking leader empathy with performance. It also highlights practical implications for leadership development while recognizing that empathy requires appropriate boundaries and should not be equated with reduced accountability. Future empirical research is needed to test the proposed relationships across organizational contexts.

Keywords: *Empathetic leadership, Psychological safety, Employee engagement, Work engagement, Employee performance, Social exchange theory, Job demands-resources theory*

1. Introduction and background

Organizations are now operating in environments that are gradually being marked by uncertainty, interdependence, technological change, and shifting employee expectations. These conditions have strengthened interest in leadership approaches that extend beyond transactional coordination to the quality of relationships between leaders and employees. One such approach is empathetic leadership, which emphasizes a leader's capacity to recognize, understand, and respond appropriately to employees' perspectives, emotions, and work-related concerns (Kock et al., 2019; Muss et al., 2026; Zivkovic, 2022). Kock et al. (2019) conceptualize empathetic leadership around the communication of emotional support and understanding. Their work suggests that such leadership can influence follower attitudes and performance. More recent research also positions empathy as a growing+ relevant relational capability in contemporary leadership practice (Crane, 2025; Muss et al., 2026; Yusoff, 2026).

Empathy in leadership is important because employees do not experience leadership only through formal decisions or performance expectations. They also interpret their leaders' ability to listen to them,

understand their circumstances, and respond to their needs with concern and respect (Crane, 2025; Muss et al., 2026). These relational signals shape how employees evaluate both their leaders and the broader work environment. Empathetic leadership may therefore function as a social resource that strengthens interpersonal relationships, reduces perceived threat, and encourages employees to contribute more at work. Empirical evidence has linked empathetic leadership with outcomes including job satisfaction, innovation, proactive behavior, and performance (Bani-Melhem et al., 2021; Kock et al., 2019). Recent evidence also indicates that leader empathy is positively associated with employees' psychological safety (Du & Xie, 2025).

Psychological safety is particularly relevant to understanding why empathy may matter. It reflects a work environment in which individuals experience reduced interpersonal risk when speaking up, asking questions, admitting mistakes, or offering new ideas. Research has established leadership as an important influence on psychological safety. Psychologically safe environments have also been associated with learning, collaboration, voice, and performance (Edmondson & Bransby, 2023; Frazier et al., 2017). When employees believe that leaders understand their concerns rather than dismissing them, they may be more willing to express themselves and participate actively. Research in related leadership domains supports this reasoning. For example, psychological safety has been shown to mediate the relationship between inclusive leadership and work engagement (Siyal, 2023).

Employee engagement provides another important mechanism through which empathetic leadership may influence performance. For conceptual precision, this paper approaches employee engagement primarily through the established work engagement tradition. Work engagement refers to a positive motivational state characterized by vigor, dedication, and absorption (Bakker et al., 2023; Hakanen & Kaltiainen, 2026). Engaged employees invest substantial cognitive, emotional, and behavioral energy in their work. This is important for organizations because engagement is consistently associated with job performance. Corbeanu & Iliescu (2023) meta-analysis found a positive overall relationship between work engagement and job performance across 166 independent samples.

Despite these advances, the relevant literature remains fragmented. Studies on empathetic leadership have examined outcomes such as satisfaction, innovation, performance, and proactive behavior. Meanwhile, psychological safety and engagement are frequently examined within closely related leadership traditions, such as inclusive, servant, and transformational leadership (Bani-Melhem et al., 2021; Edmondson & Bransby, 2023; Siyal, 2023). Consequently, less attention has been devoted to an integrated explanation of how empathetic leadership may simultaneously shape psychological safety, employee engagement, and subsequent performance. This fragmentation limits understanding of the mechanisms through which leaders' empathetic behaviors may translate into meaningful workplace outcomes.

This paper addresses this gap by integrating empathetic leadership, psychological safety, employee engagement, and employee performance within a unified framework. It proposes that empathetic leadership contributes to employee performance through psychologically safe conditions and stronger employee engagement. By connecting relational, psychological, and motivational processes, the paper seeks to clarify how leaders' understanding and support of employees can be translated into stronger individual and organizational outcomes.

2. Literature review and proposition development (Conceptual foundations)

2.1 Empathetic leadership as a relational leadership capability

Empathy is generally understood as a multidimensional capacity involving cognitive understanding of another person's perspective, affective sensitivity to another person's emotional state, and behavioral

communication of that understanding. In leadership settings, these dimensions become significant because employees evaluate not only what leaders decide but also whether leaders recognize their experiences and respond appropriately. Kock et al. (2019) conceptualize empathetic leadership as a process through which leaders communicate understanding and emotional support to followers. A recent systematic review by Muss et al. (2026) reinforces this multidimensional view. Their synthesis shows that the effects attributed to empathetic leaders span affect, attitudes, interpersonal relationships, performance, and well-being.

Empathetic leadership is therefore more specific than general interpersonal warmth. It involves perspective-taking, attention to employee cues, emotional understanding, and supportive responses that communicate respect and value. It is also different from other related constructs. For example emotional intelligence concerns a broader set of capabilities associated with perceiving, understanding, and regulating emotions. Inclusive leadership emphasizes openness, accessibility, and participation. Empathetic leadership places greater emphasis on accurately appreciating employees' perspectives and emotional experiences and communicating that understanding through leader behavior. Although these constructs can overlap, treating empathy as a distinct relational mechanism allows clearer examination of how employees interpret leader behavior (Kock et al., 2019; Muss et al., 2026).

Empathetic leadership has been associated with positive attitudes, innovation, proactive behavior, well-being, and performance (Kock et al., 2019; Muss et al., 2026). However, sustained empathic demands may place significant emotional burden on leaders. This may create strain when adequate resources and boundaries are absent (Yusoff, 2026). The present framework therefore does not equate empathy with permissiveness or the lowering of performance expectations. Instead, it views empathy as a relational capability through which leaders can understand employees while maintaining organizational goals and standards.

2.2 Theoretical grounding: social exchange and job demands-resources perspectives

Two theoretical perspectives provide the foundation for the proposed relationships. Social exchange theory proposes that workplace relationships develop through reciprocal exchanges of valued resources and favorable treatment (Cropanzano & Mitchell, 2005). When employees perceive that leaders listen to their concerns, understand their circumstances, and demonstrate genuine support, they may interpret such behavior as a relational investment. Employees may respond through stronger attachment, cooperation, and constructive work behavior. Research on organizational support similarly indicates that employees respond favorably when they believe that their contributions are valued and their well-being is taken seriously (Eisenberger et al., 2020; Kurtessis et al., 2017).

Job demands-resources (JD-R) theory complements this exchange perspective. The theory proposes that job resources help employees meet work demands, achieve goals, preserve energy, and maintain motivation (Bakker et al., 2023). Leadership can constitute an important social resource within this process. Empathetic leaders provide socioemotional resources through listening, recognition, reassurance, and context-sensitive support. Such resources can reduce relational strain while making it easier for employees to seek assistance, discuss difficulties, and remain motivated. Empathy may therefore affect performance not merely because employees prefer empathetic leaders, but because leader behavior changes the social and psychological resources available to employees.

Social exchange theory and JD-R theory provide complementary explanations. Social exchange theory explains why employees may reciprocate supportive treatment, while JD-R theory explains how supportive leadership provides resources that sustain motivation. Psychological safety and employee engagement consequently represent plausible mechanisms through which empathetic leadership can influence performance.

2.3 Empathetic leadership and psychological safety

Psychological safety refers to a work environment in which individuals perceive reduced interpersonal risk when expressing concerns, asking questions, acknowledging mistakes, or contributing alternative viewpoints. It does not imply freedom from accountability. Rather, it reflects confidence that appropriate interpersonal risk-taking will not lead to humiliation, rejection, or unnecessary punishment. Leadership has consistently been identified as an important antecedent because leaders strongly influence how employees expect such interpersonal risks to be received (Edmondson & Bransby, 2023; Frazier et al., 2017).

Empathetic leadership fosters psychological safety through several mechanisms. Perspective-taking helps leaders understand why employees may hesitate to raise concerns. Emotional sensitivity can reduce dismissive or unnecessarily punitive reactions. Supportive communication signals that employee viewpoints are worthy of consideration even when the leader does not ultimately agree. These behaviors reduce uncertainty concerning the interpersonal consequences of speaking openly. Evidence supports this reasoning. Bani-Melhem et al. (2021) found that empathetic leadership buffered conditions that could undermine frontline employees' psychological safety. More recently, (Du & Xie, 2025) found a positive relationship between leader empathy and employees' psychological safety within their model of leader mindfulness in communication. The following is therefore proposed:

Proposition 1: *Empathetic leadership is positively associated with employee psychological safety.*

2.4 Empathetic leadership and employee engagement

This paper adopts *work engagement* as its principal conceptualization of employee engagement. Work engagement represents a positive affective-motivational state characterized by vigor, dedication, and absorption (Hakanen & Kaltiainen, 2026). Engaged employees invest substantial energy and attention in their work and tend to persist when demands arise. Engagement is shaped by both job characteristics and social resources. Leadership is therefore an important part of the motivational context in which engagement develops (Bakker et al., 2023; Hakanen & Kaltiainen, 2026). Empathetic leadership may strengthen employee engagement through reciprocity and resource provision. Employees who feel heard, understood, and valued are more likely to view their relationship with the leader positively. In social exchange terms, they may reciprocate this favorable treatment through stronger psychological investment and discretionary effort. Empathy can also help leaders identify barriers to performance and provide support that reflects employees' actual circumstances. These actions can preserve motivational resources that might otherwise be consumed by interpersonal conflict, uncertainty, or perceived neglect. Recent evidence strengthens this argument. Durman et al. (2026) found that empathetic leadership significantly enhanced employee engagement among Generation Z employees in Indonesia and India. Their results also show that job crafting functioned as a motivational mechanism linking leadership with engagement. Other emerging studies similarly associate empathetic leadership with employee voice, constructive attitudes, and engagement-related outcomes, suggesting that employees are more willing to invest themselves in work when leader behavior communicates understanding and support (Khan et al., 2026; Yusoff, 2026). The following is therefore proposed:

Proposition 2: *Empathetic leadership is positively associated with employee engagement.*

2.5 Psychological safety and employee engagement

Psychological safety is also likely to serve as a mechanism connecting empathetic leadership with engagement. Engagement requires employees to invest cognitive, emotional, and behavioral energy in their roles. Such investment becomes more difficult when individuals devote significant attention to self-protection, impression management, or fear of negative interpersonal consequences. In psychologically safe environments, employees can allocate greater attention to learning, collaboration,

experimentation, and task involvement (Edmondson & Bransby, 2023; Frazier et al., 2017). Research involving related relational leadership approaches supports this mechanism. Siyal (2023) found that psychological safety mediated the relationship between inclusive leadership and work engagement. Although inclusive leadership and empathetic leadership are distinct constructs, both communicate interpersonal acceptance and leader availability. Empathetic leadership may offer an additional mechanism because it focuses directly on understanding employees' subjective experiences. Employees who believe that leaders will try to understand their circumstances surrounding a mistake, concern, or dissenting opinion should be less inclined to remain silent or psychologically withdrawn. Psychological safety can therefore be viewed not only as an outcome of empathy but also as a condition that facilitates deeper employee involvement. The following is therefore proposed:

Proposition 3: *Psychological safety is positively associated with employee engagement and positively influences the empathetic leadership-employee engagement link.*

2.6 Employee engagement and employee performance

Employee performance represents the outcome variable in the proposed framework. Work engagement is consistently associated with performance because engaged employees tend to demonstrate greater energy, persistence, concentration, and willingness to invest effort in their roles. Corbeanu & Iliescu (2023) meta-analysis of 166 independent samples found a positive relationship between work engagement and job performance, including task and contextual performance. Contemporary engagement literature also identifies performance as an important consequence of sustained work engagement (Hakanen & Kaltiainen, 2026).

Empathetic leadership may therefore influence performance through a motivational pathway rather than only through a direct leader-to-performance relationship. Kock et al. (2019) provided initial evidence that empathetic leadership can influence follower performance through favorable affective and behavioral processes. The framework in this study extends this reasoning by positioning psychological safety and employee engagement as sequential mechanisms. Empathetic leadership communicates understanding and support. These signals reduce perceived interpersonal risk. Greater psychological safety then allows employees to participate more fully, while engagement converts this willingness into sustained motivational investment. This process is consistent with JD-R theory because social and psychological resources can stimulate motivational processes that facilitate positive work outcomes (Bakker et al., 2023; Kock et al., 2019). The following is therefore proposed:

Proposition 4: E*mployee engagement is positively related to employee performance.*

These four propositions position empathetic leadership as the relational starting point of the conceptual model rather than as an isolated leader characteristic. The framework explains how understanding employees can translate into performance through two interconnected conditions. Employees must first feel sufficiently safe to participate openly and then sufficiently motivated to invest sustained energy in their work. The resulting sequence is shown in Figure 1. This integrated framework preserves the conceptual distinctions among the constructs while explaining how they may operate together.

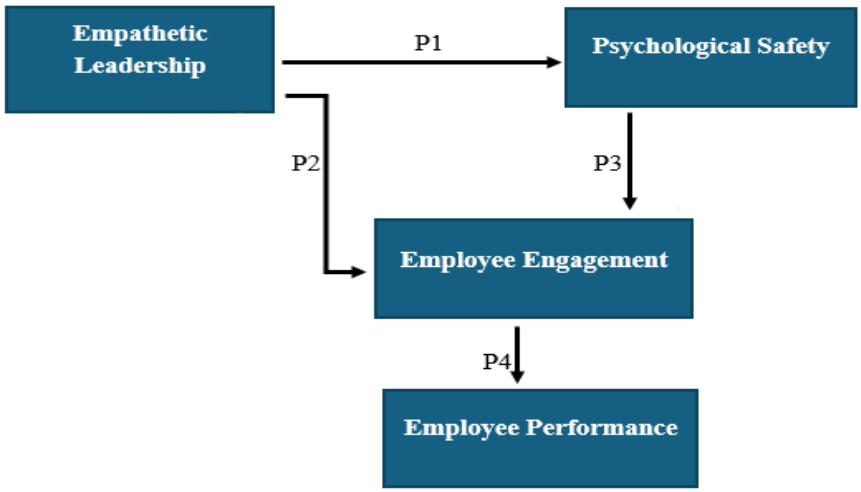

Figure 1: Conceptual Framework of the Empathic leader-Performance sequential relationship

3. Methodological approach

This study adopts a *conceptual theory-synthesis* approach supported by an integrative review of relevant literature. Conceptual research is appropriate when the objective is to connect previously separate theoretical perspectives, clarify relationships among constructs, and develop explanations that extend existing knowledge rather than test hypotheses using new empirical data (Jaakkola, 2020). Accordingly, the purpose of this study is not to conduct a systematic review or meta-analysis. Instead, it integrates research on empathetic leadership, psychological safety, employee engagement, and employee performance to develop a coherent explanatory framework. This approach is consistent with the view that literature-based inquiry can generate theoretical knowledge by synthesizing and conceptualizing existing research (Kunisch et al., 2023; Snyder, 2019).

The literature search was organized around the central constructs and theoretical relationships identified in the research problem. Relevant literature was sought using combinations of terms including "*empathetic leadership*", "*leader empathy*", "*empathy at work*", "*psychological safety*", "*employee engagement*", "*work engagement*", "*employee performance*", "*job performance*", "*social exchange theory*", and "*job demands-resources theory*". Priority was given to peer-reviewed articles in leadership, organizational behavior, human resource management, and organizational psychology. Recent studies were emphasized to reflect contemporary literature, while seminal studies were retained where necessary to establish the theoretical foundations of the constructs. Conceptual articles, empirical studies, meta-analyses, and high quality review articles were considered because integrating different forms of evidence can strengthen theory development in conceptual research (Snyder, 2019; Torraco, 2016).

Source selection was guided primarily by theoretical relevance rather than exhaustive coverage. Studies were retained when they contributed directly to defining the focal constructs, explaining relationships among them, or supporting the theoretical mechanisms underlying the proposed framework. Literature addressing empathy outside workplace or leadership settings without a meaningful organizational connection was excluded. This purposive and iterative approach is consistent with theory synthesis research, in which concepts and theories are selected for their capacity to address fragmentation and

generate a more integrated explanation of a phenomenon (Jaakkola, 2020). Table 1 shows the key selected studies that informed the proposed framework developed for this study.

Table 1: *Key selected literature informing the conceptual framework*

Author(s) Year	Contribution to the literature	Significance to the present study
Cropanzano & Mitchell (2005)	Synthesized social exchange theory and reciprocity in organizational relationships.	Provides the theoretical basis for explaining why employees may reciprocate empathetic and supportive leadership with positive work behaviors.
Kock et al. (2019)	Developed and initially tested a theory of empathetic leadership linking leader understanding and emotional support with follower outcomes and performance.	Provides the principal conceptual foundation for empathetic leadership and its proposed relationship with employee performance.
Frazier et al. (2017)	Meta-analytically examined antecedents and outcomes of psychological safety across individual and group levels.	Establishes psychological safety as an important workplace mechanism connecting interpersonal conditions with employee behaviors and performance.
Bani-Melhem et al. (2021)	Examined empathetic leadership, psychological safety, and proactive employee behavior among frontline employees.	Provides direct empirical support for connecting empathetic leadership with psychological safety and constructive employee behavior.
Decuypere & Schaufeli (2021)	Meta-analyzed positive leadership styles and work engagement and identified common explanatory mechanisms.	Supports the proposition that supportive relational leadership can contribute to stronger employee engagement.
Bakker et al. (2023)	Updated job demands-resources theory and explained how job and social resources contribute to motivation and work engagement.	Provides the resource-based theoretical explanation for how empathetic leadership can strengthen engagement.
Edmondson & Bransby (2023)	Synthesized contemporary research on psychological safety, its antecedents, processes, and organizational consequences.	Supports psychological safety as the key psychological mechanism between empathetic leadership and employee engagement.

Author(s) Year	Contribution to the literature	Significance to the present study
Mazzetti et al. (2023)	Meta-analyzed work engagement within the JD-R framework, including the roles of social, job, developmental, and personal resources.	Strengthens the argument that supportive workplace resources facilitate employee engagement.
Corbeanu & Iliescu (2023)	Meta-analyzed the relationship between work engagement and task and contextual performance.	Provides strong empirical support for the proposed engagement-performance relationship.
Muss et al. (2026)	Synthesized research on the effects of empathetic leaders across multiple organizational outcomes.	Establishes the contemporary evidence base for empathetic leadership and highlights the fragmentation that the present integrated framework addresses.

The selected literature was synthesized conceptually rather than statistically. Findings across the four research streams were compared to identify recurring relationships and plausible explanatory mechanisms. Social exchange theory and job demands-resources theory were then used to connect the relationships. This process resulted in the four propositions developed in Section 2 and the integrated pathway linking *empathetic leadership to psychological safety, employee engagement, and employee performance*. The approach therefore moves beyond summarizing prior studies toward explaining how previously dispersed findings can be connected within a unified conceptual model.

4. Findings and discussion

The conceptual synthesis reveals a consistent pattern across the literature. Empathetic leadership appears to influence employee outcomes through interconnected relational, psychological, and motivational processes. The evidence reviewed supports the proposed sequence in which empathetic leadership strengthens psychological safety, psychological safety encourages engagement, and engagement contributes to employee performance. However, the strength of evidence is not uniform across all relationships. Dimpirical research on empathetic leadership remains less developed than research on psychological safety and work engagement. This distinction is important when interpreting the four propositions.

4.1 Empathetic leadership as the relational starting point

The first major finding is that empathy can be understood as a leadership resource that shapes employees' interpretation of their relationship with the leader. Kock et al. (2019) demonstrated that leaders' communication of emotional support and understanding can influence follower attitudes and performance. More broadly, Muss et al. (2026) systematically reviewed 42 studies and identified effects of empathetic leadership across areas including affect, attitudes, interpersonal relationships, performance, and well-being. The predominance of positive outcomes across these categories provides support for positioning empathetic leadership as the starting point of the proposed framework.

This finding also extends the interpretation of empathy beyond being a desirable interpersonal quality. From a social exchange perspective, empathetic behavior communicates that employees are valued and that their experiences matter. Employees may consequently reciprocate through cooperation,

commitment, and greater investment in their work. From a JD-R perspective, supportive leadership represents a social resource that can help employees manage demands while maintaining motivation. Job resources are strongly associated with work engagement, while social resources also show meaningful positive relationships with engagement (Bakker et al., 2023; Mazzetti et al., 2023).

4.2 Psychological safety as a central explanatory mechanism

The synthesis provides substantial support for Proposition 1, which links empathetic leadership with psychological safety. Employees are more likely to speak openly when they expect leaders to respond to concerns with understanding rather than dismissal or unnecessary interpersonal punishment. Empathetic responses may therefore reduce the perceived risks associated with asking questions, reporting problems, acknowledging uncertainty, or challenging established practices.

Evidence from Bani-Melhem et al. (2021) is particularly relevant. Their study of frontline employees found that empathetic leadership mitigated the negative effects associated with low psychological safety and supported proactive work behavior. More recent evidence from Du & Xie (2025) also positioned leader empathy as an important mechanism associated with employees' psychological safety. These findings align with the broader psychological safety literature, which identifies leadership behavior and interpersonal relationships as important conditions shaping whether employees feel safe to contribute (Edmondson & Bransby, 2023).

Psychological safety therefore appears to perform a bridging function in the model. Empathetic leadership communicates interpersonal acceptance, while psychological safety reflects employees' interpretation of the environment created by such behavior. This distinction is theoretically important. A leader may intend to behave empathetically, but the motivational benefits of that behavior are unlikely to emerge fully unless employees actually experience the workplace as safe for interpersonal risk-taking.

4.3 From psychological safety to employee engagement

The literature also supports Propositions 2 and 3, although the evidence is stronger for the broader leadership-engagement relationship than for empathetic leadership specifically. Work engagement depends partly on whether employees possess sufficient resources to invest energy, attention, and persistence in their roles. Meta-analyzed evidence indicates that personal, developmental, job, and social resources are positively related to work engagement (Mazzetti et al., 2023). Empathetic leadership may contribute to this resource environment by offering understanding, support, and opportunities for constructive communication.

Psychological safety strengthens this explanation. Employees who fear embarrassment, rejection, or negative consequences may devote considerable energy to self-protection. This can reduce the energy available for meaningful involvement in work. In contrast, psychologically safe employees can direct greater attention toward learning, collaboration, and contribution. Siyal (2023) found that psychological safety mediated the relationship between inclusive leadership and work engagement. Although inclusive and empathetic leadership are not identical, the finding provides useful evidence for the proposed mechanism because both approaches involve leader accessibility, acceptance, and relational support. The conceptual contribution is therefore not simply that empathy increases engagement. Rather, empathy may create relational conditions under which employees feel sufficiently secure to invest themselves more fully in their work.

4.4 Engagement as the pathway to performance

The final stage of the framework receives particularly strong empirical support. Corbeanu & Iliescu (2023) meta-analysis reported an overall correlation of $r = .37$ between work engagement and job

performance across 166 independent samples. A separate meta-analysis by Neuber et al. (2022) similarly found a substantial positive relationship between work engagement and task performance. These findings support the argument that vigor, dedication, and absorption have meaningful implications for how employees perform their roles.

Accordingly, Proposition 4 provides the principal integrative contribution of this paper. Empathetic leadership is proposed to influence performance through a sequential process:

This pathway helps explain why empathy should matter for organizational outcomes. Empathy does not improve performance merely because employees feel positively toward an understanding leader. Rather, leader empathy can influence the psychological conditions under which employees operate. Greater safety facilitates participation and openness. These conditions can strengthen engagement, which in turn supports performance.

The relationship should however, not be interpreted as automatic or universally positive. Empathy without appropriate boundaries may impose emotional demands on leaders. Recent literature highlights the possibility of empathy-related emotional stress and strain when leaders are expected to absorb employees' difficulties continuously (Yusoff, 2026). Empathetic leadership should therefore be understood as a "balanced understanding" rather than an "unrestricted emotional accommodation".

Overall, the findings support the four propositions while also exposing an important research gap. Evidence linking psychological safety, engagement, and performance is comparatively fully developed, whereas direct research examining the entire empathetic leadership pathway remains limited. The proposed model therefore represents a theoretically grounded explanation that requires further empirical testing.

5. Implications

The proposed framework has implications for both leadership theory and organizational practice. Its central contribution is to explain why empathetic leadership may matter for employee performance. Rather than treating empathy as a desirable interpersonal characteristic alone, the framework positions it as a relational leadership capability that can shape psychological safety, engagement, and subsequent performance.

5.1 Theoretical implications

First, the paper extends the developing literature on empathetic leadership by specifying the mechanisms through which empathy may translate into workplace outcomes. Existing research has associated leader empathy with affective, relational, attitudinal, well-being, and performance outcomes (Kock et al., 2019; Muss et al., 2026). However, these outcomes have often been examined separately. The proposed sequential pathway integrates them by arguing that empathetic leadership creates relational conditions that promote psychological safety, which can subsequently strengthen employee engagement and performance. This contributes to a more process-oriented understanding of empathetic leadership.

Second, the framework connects social exchange theory with job demands-resources theory. Social exchange theory explains employees' tendency to reciprocate supportive and respectful leader behavior, while JD-R theory explains how leadership can provide social and psychological resources that facilitate engagement. This integration responds to calls for greater attention to the mechanisms through which leadership influences work engagement rather than continually treating leadership styles as isolated predictors (Bakker et al., 2023; Decuypere & Schaufeli, 2020, 2021). Meta-analyzed evidence shows that several positive leadership approaches influence engagement through shared

mechanisms, including resources, trust, psychological needs, and positive social exchanges (Decuypere & Schaufeli, 2021).

Third, the model reinforces psychological safety as an important bridge between leader behavior and employee motivation. Psychological safety has become particularly relevant to leadership, learning, work experience, and performance in complex organizational environments (Edmondson & Bransby, 2023; Frazier et al., 2017).

5.2 Managerial and practical implications

For organizations, the framework suggests that empathy should form part of leadership selection and development. Leadership development programs such as active listening, perspective-taking, recognition of employee concerns, and context-sensitive communication can strengthen behaviors. HR practitioners should therefore assess not only leaders' technical competence but also their capacity to understand and respond constructively to employees. Muss et al. (2026) similarly identify leaders, HR managers, and organizational decision-makers as important actors in shaping empathetic leadership practices.

Organizations should also treat psychological safety and engagement as indicators of whether empathetic leadership is producing meaningful outcomes. Leaders can promote safety by responding constructively to questions, mistakes, disagreements, and employee voice. At the same time, empathy should not be interpreted as avoiding accountability. Effective empathetic leadership combines understanding with clear expectations and appropriate boundaries. Thus, organizations should develop leaders who can demonstrate concern for employees while maintaining performance standards and protecting their own capacity to lead effectively.

6. Suggestions for future research

The proposed framework creates several opportunities for future research. First, empirical studies should test the complete sequential relationship proposed in this paper: Although evidence supports individual relationships within this pathway, relatively few studies have examined these constructs simultaneously. Recent reviews similarly show that empathetic leadership research remains fragmented across different outcomes and conceptualizations of empathy (Muss et al., 2026). Longitudinal and multi-wave studies would be particularly valuable because they could establish sequential relationships more convincingly than cross-sectional designs.

Second, future research should examine contextual and cultural boundary conditions. Empathetic behaviors may not be interpreted identically across organizations, occupations, or national cultures. Leadership expectations, power distance, organizational climate, and the nature of employee-leader relationships could strengthen or weaken the proposed effects. Existing research on related leadership approaches demonstrates that psychological safety and engagement can operate differently across organizational contexts (Siyal, 2023). Comparative studies across countries, industries, and public and private organizations could therefore improve the generalizability of the framework.

Third, researchers should examine potential moderators such as workload, job demands, leader-member exchange quality, virtual working arrangements, and individual employee differences. Such research could identify when empathy is particularly valuable and when its effects are weaker.

Finally, greater attention should be given to the potential costs and limits of empathetic leadership. Empathy should not automatically be assumed to produce positive outcomes. Sustained emotional involvement may increase leaders' emotional strain and exhaustion, particularly in roles characterized by intensive interpersonal demands (Simon et al., 2022; Yusoff, 2026). Future research should therefore

investigate whether leader well-being, organizational support, and appropriate interpersonal boundaries moderate the benefits of empathy. Experimental and intervention studies could also determine whether empathy-focused leadership development produces lasting improvements in psychological safety, engagement, and performance. Such research would help establish not only whether empathetic leadership works, but when, for whom, and under what organizational conditions it is most effective.

7. Conclusion

Empathy is becoming more and more relevant to leadership in workplaces where employees are expected to collaborate, communicate openly, adapt to change, and maintain high levels of performance. This paper has argued that empathetic leadership should be understood not merely as interpersonal sensitivity but as a relational leadership capability through which leaders recognize employees' perspectives and emotions and respond with appropriate understanding and support. Existing evidence indicates that leader empathy can influence employee attitudes, relationships, well-being, and performance, although the field remains comparatively fragmented (Kock et al., 2019; Muss et al., 2026).

Drawing on social exchange theory and job demands-resources theory, the paper developed an integrated framework linking empathetic leadership, psychological safety, employee engagement, and employee performance. The framework proposes that empathetic leadership creates relational conditions that reduce interpersonal risk and strengthen psychological safety. Psychological safety, in turn, enables employees to invest themselves more fully in their work. Greater engagement can subsequently contribute to stronger performance. This reasoning is consistent with established evidence regarding the importance of psychological safety in contemporary organizations and the positive relationship between work engagement and job performance (Corbeanu & Iliescu, 2023; Edmondson & Bransby, 2023).

The paper therefore shifts attention from asking simply whether empathy matters in leadership to explaining how and through which mechanisms it may matter. At the same time, empathetic leadership should not be equated with unlimited emotional accommodation or reduced accountability. Its value lies in combining genuine understanding of employees with appropriate boundaries and organizational expectations. The proposed framework offers a foundation for future empirical research and for leadership practices aimed at developing workplaces in which employees feel understood, safe to contribute, engaged in their roles, and capable of performing effectively.

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RESEARCH ARTICLE

Gross Margin Performance and Marketing Efficiency of Beef across Delta State Abattoir, Open Market, Meat Shop and Hotel Distribution Channels

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ABSTRACT

This study evaluated the gross margin performance and marketing efficiency of four beef distribution channels in Delta State, Nigeria: abattoirs, open markets, meat shops, and hotels. A proportional random sample of 320 respondents was drawn from four purposively selected Local Government Areas (LGAs). Gross margin analysis and Acharya's Modified Measure of Marketing Efficiency (MME) were employed to estimate profitability and marketing efficiency across the distribution channels. The findings revealed significant variations in average total revenue and gross margins among the channels. Abattoirs recorded the highest gross margin percentage (39.7%), while hotels exhibited the highest marketing efficiency index (1.56). The major constraints contributing to cost inefficiency and value loss included inadequate storage facilities, high operating costs, limited access to credit, and poor handling equipment. The study recommends policies and interventions aimed at reducing operational costs, improving storage and hygiene infrastructure, enhancing access to credit, and strengthening business management capacity among beef marketers. These measures are expected to improve competitiveness, increase profitability, and enhance overall value-chain efficiency in the beef marketing sector.

Keywords: Gross margin performance; Marketing efficiency; Abattoirs; Hotels; Meat shops; Open markets.

1.0 Introduction

Agriculture has long been recognized as a cornerstone of Nigeria's economy. However, decades of inadequate investment and policy neglect constrained the sector's productivity and limited its contribution to national food security. In response, the Federal Government introduced the Agricultural Transformation Agenda (ATA) in 2010 under President Goodluck Jonathan, repositioning agriculture as a business-driven sector and promoting greater private-sector participation. Although the ATA stimulated significant reforms, subsequent assessments revealed persistent challenges, including high food import dependence, limited access to finance, and weak agricultural value-chain integration (FMARD, 2018; Paul, 2018). To address these shortcomings, the Agricultural Promotion Policy (APP) was launched in 2016 with the objective of developing a sustainable agribusiness economy capable of ensuring food security, promoting exports, and generating employment opportunities (Premium Times, 2020).

Within this policy framework, the livestock subsector, particularly the beef industry, occupies a strategic position in Nigeria's agricultural economy. The industry provides livelihoods for millions of people, including pastoralists, processors, wholesalers, butchers, transporters, and retailers, while also contributing substantially to household nutrition and national economic growth (Odoemena, Walters, & Kleemann, 2020). Rising demand for animal protein further highlights the importance of the sector. Meat consumption in Africa is projected to increase significantly by 2050, with Nigeria remaining one of the continent's largest consumers of beef and poultry products (ILRI, 2017; NBS, 2016).

Despite its economic importance, the beef industry continues to face numerous marketing and distribution challenges. Previous studies have identified poor infrastructure, inadequate market information systems, limited access to credit facilities, and weak institutional support as major constraints affecting livestock marketing efficiency (Ouma et al., 2019; Alary et al., 2018). Similarly, Grace et al. (2020) emphasized the need for improved sanitary standards, cold-chain facilities, and meat handling practices to satisfy the quality requirements of urban and export markets. In Nigeria, studies by Adebayo (2017) and Yusuf and Abiola (2019) reported that high transaction costs, fragmented supply chains, inadequate storage facilities, and limited value-addition activities reduce profitability and competitiveness within the beef marketing system.

Marketing efficiency is widely recognized as an important indicator of market performance because it reflects the effectiveness with which resources are utilized in moving products from producers to consumers. According to Erie (2015), a highly efficient market minimizes marketing costs while maximizing value creation and returns to market participants. Conversely, low marketing efficiency often signals structural deficiencies, excessive transaction costs, resource wastage, and poor coordination among actors within the value chain. Consequently, assessing the efficiency of beef marketing channels is essential for improving both producer and consumer welfare and for supporting national agricultural development objectives.

In addition to marketing efficiency, gross margin performance provides a useful measure of profitability among market participants. Gross margin analysis enables the comparison of returns across different distribution channels by examining the relationship between revenues earned and variable costs incurred. Differences in gross margins may reflect variations in marketing practices, operating costs, market access, consumer preferences, and value-addition activities across marketing outlets.

Although several studies have examined livestock marketing in Nigeria, limited empirical evidence exists on the comparative gross margin performance and marketing efficiency of specific beef distribution channels. Delta State presents an important case study because beef is distributed through multiple outlets, including abattoirs, open markets, meat shops, and hotels, each characterized by distinct operational structures, pricing mechanisms, customer segments, and cost profiles. Understanding the profitability and efficiency of these channels is essential for identifying areas of resource loss and opportunities for improving value-chain performance.

This study was therefore designed to evaluate the gross margin performance and marketing efficiency of major beef distribution channels in Delta State. Specifically, the study sought to:

i. evaluate the gross margin performance of abattoirs, open markets, meat shops, and hotel distribution channels in Delta State;
ii. assess the marketing efficiency of these distribution channels and identify sources of cost inefficiency and value loss; and
iii. identify the operational constraints affecting profitability and marketing efficiency among beef marketers.

The findings of this study are expected to contribute to a better understanding of the performance of beef marketing channels in Nigeria. The study will provide useful information for policymakers, investors, development agencies, and other stakeholders seeking to enhance value-chain competitiveness, improve food security, increase employment opportunities, and promote sustainable agribusiness development within the livestock sector.

2.0 Materials and Methods

2.1 Study Area

The study was conducted in Delta State, Nigeria, which occupies a total land area of approximately 16,842 km^2. The average annual rainfall ranges from about 266.5 mm in some coastal areas to approximately 1,905 mm in the northern parts of the state. Rainfall is usually heaviest in July, while temperature generally increases from the southern to the northern region of the state.

Historically, Delta State was part of Nigeria's former Western Region. It became a separate state on 27 August 1991, having previously formed part of the former Midwestern State (1963-1976) and Bendel State (1976-1991). At its creation, the state consisted of twelve Local Government Areas (LGAs). This number increased to nineteen LGAs on 27 September 1991 and was further expanded to twenty-five LGAs in 1997.

Asaba, the state capital, is located at the northern end of Delta State. It occupies an estimated land area of 762 km^2 and lies within the western Niger Delta region along the Gulf of Guinea on the Atlantic coast. The state has a coastline of approximately 167 km. These geographical and climatic characteristics support diverse agricultural and livestock marketing activities within the state (Delta State Ministry of Agriculture and Natural Resources, 2011).

2.2 Population and Sampling Procedure

The population for the study comprised actors engaged in beef marketing through abattoirs, open markets, meat shops, and hotels in Delta State. Information obtained from the Delta State Beef Marketing Association indicated that there were approximately 1,595 beef marketers operating within the state at the time of the study.

A multistage sampling procedure was adopted for the study. First, four Local Government Areas (LGAs) were selected from the twenty-five LGAs in Delta State using a simple random sampling technique. Second, a purposive sampling technique was employed to select one abattoir, one open market, one meat shop, and one hotel from each selected LGA. The selection was based on the prominence of beef marketing activities within the areas.

The sample size was determined using the Taro Yamane formula. Thereafter, a proportional random sampling technique was employed to select a total of 320 respondents across the four marketing channels: abattoirs, open markets, meat shops, and hotels. Table 1 presents the distribution of respondents across the selected marketing channels.

Taro Yamane Formula of Sample Size Determination:

$$n = \frac{N}{1+N(e)^2}$$ (Puszczak et al, 2013).

Where: n = Sample size
N = Population size (1595)

e = Limit of tolerance error
With a significance level of 95% degree of tolerance level (i.e. 0.05).
Mathematically, the sample size is calculated as follows:
Sample size for beef marketers = $1 + 1595\ (0.05)^2$ = approximately 320

2.3 Data Collection and Analysis

Recognizing that not all actors involved in beef marketing in Delta State were literate, the study adopted a mixed data collection approach. Structured questionnaires were administered to literate respondents, while oral interviews were conducted for respondents who could not read or write. This approach ensured inclusiveness and facilitated comprehensive coverage of all categories of participants across the various beef marketing channels.

Data collected from the respondents were analyzed using descriptive statistics, gross margin analysis (GMA), and Acharya's Modified Measure of Marketing Efficiency (MME). Descriptive statistics, including frequencies, percentages, means, and ranking scales, were used to summarize respondents' socioeconomic characteristics and identify operational constraints affecting beef marketing. Gross margin analysis was employed to estimate profitability across the marketing channels, while the Modified Measure of Marketing Efficiency was used to assess the efficiency of the various distribution channels.

2.4 Model Specifications

(a) Gross Margin Analysis

Gross Margin Analysis (GMA) was used to determine the profitability of beef marketing across the selected distribution channels. Gross margin was estimated as the difference between total revenue and total variable costs incurred by marketers. The gross margin model is specified as follows:

$GM = TR - TVC$

Where:

GM = Gross Margin (₦)

TR = Total Revenue (₦)

TVC = Total Variable Cost (₦)

A positive gross margin indicates profitability, while a negative gross margin suggests that variable costs exceeded revenue during the marketing period.

(b)Archarya MME

$$MME = \frac{RP}{MC + MM}$$ (Archarya, 1988)

Where:

(b) Acharya's Modified Measure of Marketing Efficiency (MME)

Marketing efficiency was assessed using Acharya's Modified Measure of Marketing Efficiency (MME), expressed as:

Where:

MME = Modified Measure of Marketing Efficiency
RP = Retailer's selling price (consumer price) (₦)
MC = Total marketing cost (₦), including transportation, storage, handling, processing, and other related marketing expenses
MM = Marketing margin (₦), representing the profits earned by intermediaries in the marketing channel
The Modified Measure of Marketing Efficiency compares the value paid by consumers with the combined marketing costs and margins incurred along the distribution channel. The efficiency of the marketing system was interpreted as follows:

MME > 1: Efficient marketing system, indicating that the consumer price exceeds the combined marketing costs and margins.
MME = 1: Break-even efficiency, indicating that the consumer price is just sufficient to cover marketing costs and margins.
MME < 1: Inefficient marketing system, indicating that marketing costs and margins are disproportionately high relative to the consumer price.

This model was employed to evaluate and compare the relative efficiency of beef marketing across the selected distribution channels in Delta State.

3.0 Results and Discussion

Objective I: Evaluation of Gross Margin Performance Across Abattoir, Open Market, Meat Shop, and Hotel Distribution Channels in Delta State

Table 2 presents the major gross margin indicators for the four distribution channels. The results reveal notable variations in revenue, cost structure, and profitability across the channels. Purchase costs and transportation expenses constituted the largest components of marketing costs across all channels. Although abattoirs recorded the highest average sales volume, they did not generate the highest revenue per transaction. In contrast, hotels generated the highest average revenue despite handling relatively lower sales volumes.

Volume and Gross Margin Performance

Abattoirs handled the highest average quantity of beef (350.6 kg) and recorded the highest absolute gross margin (₦176,041.50). However, hotels and meat shops achieved higher revenue per unit and stronger gross margin ratios than open markets. This finding suggests that value addition through processing, preparation, improved presentation, and premium pricing strategies enables hotels and meat shops to generate higher returns despite operating at lower sales volumes.

Cost Structure

Purchase costs represented the largest expense across all marketing channels. Hotels incurred the highest purchase costs, possibly due to the procurement of higher-quality beef or reliance on relatively more expensive supply sources. Transportation costs also constituted a significant component of total

marketing costs and had a greater effect on channels with relatively lower profit margins, particularly open markets.

Channel Heterogeneity

The variation in gross margin percentages, ranging from 30.1% to 39.7%, indicates differences in pricing power, service quality, operational efficiency, and cost absorption capacity across the channels. Although abattoirs recorded the highest absolute gross margin, their comparatively lower revenue per unit suggests that they benefit primarily from economies of scale rather than downstream value addition. Hotels, on the other hand, appear to achieve greater value capture through service differentiation and premium pricing.

These findings demonstrate that profitability within the beef marketing system is influenced not only by sales volume but also by the ability of marketers to create and capture additional value.

Objective II: Assessment of Marketing Efficiency

Table 3 presents the marketing efficiency indices for the selected beef distribution channels using Acharya's Modified Measure of Marketing Efficiency (MME). The results indicate that hotels (1.56) and meat shops (1.35) were the most efficient marketing channels, whereas abattoirs (1.24) and open markets (1.20) exhibited relatively lower efficiency levels.

The hotel channel recorded the highest efficiency index, suggesting that it was most effective in converting marketing costs and intermediary margins into consumer value. This superior performance may be attributed to better coordination, higher-quality services, stronger price realization, and greater value addition. Similarly, meat shops demonstrated relatively high efficiency despite not recording the highest consumer prices.

Although the abattoir channel recorded the highest consumer price, its efficiency level was lower due to relatively high marketing costs and operating expenses. Open markets were the least efficient channels, indicating that traditional retail outlets may incur higher relative costs compared with the value generated through their marketing activities.

Overall, the findings suggest that hotels and meat shops operate more efficiently because they combine value-added services with effective cost management. In contrast, abattoirs and open markets face higher transaction costs and operational inefficiencies, which reduce their overall marketing efficiency.

The results further indicate that marketing efficiency tends to decline as marketing costs and intermediary margins increase. Channels that effectively coordinate logistics, improve product quality, and add value to products are more likely to achieve higher efficiency levels even when operating costs are relatively high.

Objective III: Identification of Operational Constraints Driving Cost Inefficiency and Value Loss

Table 4 presents the key operational constraints identified in the study, which include: inadequate storage facilities, high marketing and operating costs, limited access to credit, inadequate equipment and infrastructure, poor market information systems, weak business management skills, and poor hygiene and handling practices

The results show that inadequate storage and cold-chain facilities (mean = 6.19) constituted the most severe constraint. Poor storage facilities increase spoilage, accelerate quality deterioration, force distress sales, and ultimately raise the effective cost per unit of beef marketed.

High operational costs and limited access to finance were also identified as major constraints. These factors restrict marketers' ability to invest in modern equipment, storage facilities, and hygiene improvements, thereby perpetuating inefficiencies, particularly among open-market traders and abattoir operators.

Information and managerial skill deficiencies were equally important constraints (3.84). Limited access to market information reduces marketers' ability to optimize procurement decisions, negotiate favorable prices, and adopt efficient business practices. Similarly, inadequate managerial capacity may result in poor record-keeping, inefficient resource allocation, and weak cost control mechanisms.

Furthermore, high purchase costs directly reduce profitability, particularly when marketers are unable to transfer increased costs to consumers through higher selling prices. Transportation and handling costs also erode gross margins, especially in channels characterized by relatively low per-unit revenues. Fragmented supply chains and weak market coordination increase transaction costs and contribute to price inefficiencies that disadvantage both producers and consumers. Poor handling and storage practices further exacerbate post-harvest losses, reducing the quantity and quality of beef available for sale and lowering realized revenues. These constraints represent the major sources of inefficiency and value loss within the beef marketing channels.

The mean scores were computed for each constraint across all respondents and were rated using a seven-point Likert scale ranging from 1 to 7. The magnitude of the mean score reflected the perceived severity of the constraint.

Higher mean scores indicate more severe constraints, greater inefficiency, and a higher likelihood of value loss.

Lower mean scores indicate less severe constraints and relatively lower impacts on marketing performance.

Taken together, the findings provide a strong basis for targeted interventions aimed at improving profitability, reducing marketing costs, and enhancing value-chain performance in Delta State's beef marketing sector.

4.0 Conclusion

The study demonstrated significant variations in gross margin performance and marketing efficiency across the major beef distribution channels in Delta State. Abattoirs achieved the highest gross margins in absolute terms due to their large sales volumes, while hotels and meat shops generated greater value per unit of beef marketed and exhibited higher levels of marketing efficiency.

The relatively lower efficiency observed among abattoirs and open markets reflects challenges associated with inadequate storage facilities, high transportation and handling costs, weak market information systems, and limited value addition. Conversely, hotels and meat shops were better positioned to capture value through improved product presentation, service delivery, and pricing strategies.

Addressing key constraints such as inadequate storage facilities, transportation costs, limited access to finance, poor handling equipment, and weak information systems would improve market performance substantially. Such interventions would reduce post-harvest losses, increase marketers' incomes, lower marketing costs, and improve consumers' access to safe, high-quality beef. Consequently, strengthening these areas is essential for enhancing gross margin performance, improving marketing efficiency, and promoting the sustainable development of the beef value chain in Delta State.

5.0 Recommendations

1. Develop cold-storage facilities in major abattoirs and open markets**.** The establishment of targeted cold-storage infrastructure will reduce spoilage, minimize post-harvest losses, extend product shelf life, and improve price realization.
2. Promote cooperative transportation systems among beef marketers. Encouraging marketers to form transportation cooperatives or syndicates will reduce per-unit transportation costs through cost sharing and route optimization.
3. Strengthen market information systems. Affordable mobile-based platforms such as SMS and WhatsApp information services should be established to disseminate real-time market prices, demand trends, and supply information, thereby reducing information asymmetry and transaction costs.
4. Improve access to affordable credit and equipment financing. Partnerships between marketers, microfinance institutions, and agribusiness lenders should be encouraged to facilitate investment in cold rooms, meat-processing equipment, and hygienic handling tools.
5. Implement training and capacity-building programmes. Regular training in meat handling, quality grading, hygiene management, record-keeping, cost control, and business management should be organized to improve operational efficiency and profitability among beef marketers.

Table 1: Sample Distribution

Channels	Population	Sample
Abattoir	420	106
Open Market	895	154
Meat Shop	145	36
Hotel	132	24
Total	1595	320

Table 2: **Gross Margin Performance across Channels**

Channel	Average quantity sold (kg)	Purchase cost (₦)	Total revenue (₦)	Gross margin (₦, %)
Abattoir	350.6	255,000	379,650	176,041.5; 39.7%
Open market	288.3	247,000	384,450	111,365.9; 30.1%
Meat shop	250.5	253,200	436,650	127,620.6; 32.5%
Hotel	230.7	264,150	459,210	150,149.1; 35.3%

Table 3: Marketing Efficiency

Channel	RP (₦)	MC (₦)	MM (₦)	Acharya Efficiency (MME)	Efficiency Rank
Abattoir	12,270.4	5,453.42	3,635.6	1.24	3
Open market	9,472.8	4,736.4	3,157.6	1.20	4
Meat shop	9,693.0	4,308.0	2,872.0	1.35	2
Hotel	10,800.7	4,154.1	2,769.4	1.56	1

Table 4: Operational Constraints that Drive Cost Inefficiency and Value Loss

Constraint	Mean	Scale
Inadequate storage facilities	6.19	7
High operational costs	5.21	6
Limited access to credit	4.83	5
Lack of handling/grading equipment	3.98	4
Inadequate market information	3.84	3
Weak business planning/management skills	3.77	2
Unhygienic market environment	3.62	1

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Competing interests

The author, Dr. Kentus N. Tibi contributed to the study conception and design. Material preparation, data collection and analysis were performed by all he authors, the draft of the manuscript was written by Dr. Kentus Tibi. All the authors, Dr. Kentus Tibi, Dr. Romanus Nwadiolu and Dr. Davina Okumpe read through and approve the manuscript.

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RESEARCH ARTICLE

Beyond Compliance: ESG Disclosure Quality, Greenwashing Risk, Sustainability Assurance and Firm Value in Malaysia Under National Sustainability Reporting Framework

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ABSTRACT

Environmental, social and governance (ESG) reporting in Malaysia is entering a new phase in which sustainability information is increasingly expected to be comparable, connected, governed and reliable. This paper critically reviews the relationship between ESG disclosure quality, greenwashing risk, sustainability assurance and firm value in Malaysia, with particular attention to the National Sustainability Reporting Framework (NSRF), the International Sustainability Standards Board (ISSB) standards, Bursa Malaysia's sustainability requirements and the broader Malaysian climate-transition architecture. Using a critical literature-review and conceptual-analysis approach, the paper draws on Malaysian regulatory documents, international sustainability standards and empirical studies of Malaysian listed companies. The reviewed empirical evidence is mixed rather than uniformly positive. Earlier Malaysian studies reported insignificant relationships between aggregate ESG measures and firm performance, while later studies found positive associations for ESG disclosure, certification or selected sustainability practices under particular conditions. More recent evidence also shows that firm size, leverage, free cash flow, external recognition, Shariah status, board characteristics and controversy exposure may condition observed relationships. These findings support closer attention to disclosure quality and credibility rather than disclosure volume alone. Regulatory evidence further shows that Malaysia is moving toward ISSB-aligned reporting while facing implementation challenges involving data systems, Scope 3 emissions, supply-chain readiness, internal controls, skills and assurance capacity. The September 2026 decision to defer mandatory reasonable assurance over Scope 1 and Scope 2 greenhouse-gas disclosures reinforces the importance of reporting maturity and control readiness. Building on the reviewed evidence and theory, rather than claiming to test causal relationships, this paper develops a conceptual framework in which ESG disclosure quality is linked to firm value through information asymmetry, stakeholder trust and risk perception, with sustainability assurance, governance quality and greenwashing risk proposed as moderating influences. These propositions are intended for future empirical testing. The paper contributes a Malaysia-specific synthesis for research during the country's transition to ISSB-aligned reporting.

Keywords: *ESG; sustainability reporting; Malaysia; National Sustainability Reporting Framework; ISSB; IFRS S1; IFRS S2; greenwashing; sustainability assurance; firm value; Bursa Malaysia; climate disclosure*

1. Introduction

Environmental, social and governance considerations have moved rapidly from the margins of corporate social responsibility into mainstream questions of corporate strategy, capital allocation, risk management and reporting. The change is especially visible in jurisdictions that are replacing fragmented voluntary sustainability narratives with standardised sustainability-related financial disclosure. Malaysia provides an important setting for examining this transition because it combines an emerging-market capital market, a substantial Islamic finance ecosystem, globally integrated manufacturing and commodity supply chains, a large micro, small and medium enterprise sector, and an increasingly formal sustainability-reporting architecture. The country's National Sustainability Reporting Framework (NSRF), launched in September 2024, establishes the IFRS Sustainability Disclosure Standards issued by the International Sustainability Standards Board (ISSB) as the baseline for sustainability disclosure in Malaysia (Securities Commission Malaysia [SC], 2024a). The resulting transition changes the core question from whether companies should talk about sustainability to how consistently, comparably and credibly they can explain sustainability-related risks and opportunities that affect enterprise prospects.

The transition is occurring against a mixed empirical backdrop. Internationally, Friede, Busch and Bassen (2015) synthesised more than 2,000 empirical studies and reported that the large majority found a non-negative relationship between ESG and corporate financial performance. Eccles, Ioannou and Serafeim (2014) similarly found that firms with long-established sustainability policies developed distinctive governance and management processes and outperformed matched low-sustainability firms over the long term. Khan, Serafeim and Yoon (2016), however, demonstrated that materiality matters: investments in financially material sustainability issues were associated with stronger performance, whereas strong ratings on immaterial issues did not produce the same effect. Gillan, Koch and Starks (2021) concluded from a broad corporate-finance literature that ESG is associated with firm characteristics, risk and value, but that conflicting theories and findings remain unresolved. These studies caution against a simplistic conclusion that all ESG expenditure or all ESG disclosure automatically generates financial value.

Malaysia-specific evidence is equally nuanced. Atan et al. (2018), examining 54 Malaysian public listed companies using Bloomberg ESG information from 2010 to 2013, did not find a significant relationship between the individual or combined ESG factors and return on equity or Tobin's Q. In contrast, Wan Mohammad and Wasiuzzaman (2021) analysed 3,966 firm-year observations from 661 Bursa Malaysia companies and found that ESG disclosure was positively associated with firm performance, including after controlling for competitive advantage. Wong et al. (2021) found that Malaysian firms receiving ESG certification experienced a lower cost of capital and higher Tobin's Q, suggesting that external recognition may influence investor confidence. Yip and Lau (2024) reported a positive ESG-performance relationship among FTSE4Good Bursa Malaysia companies but found that the effect depended on firm-level conditions such as market capitalisation, liabilities and free cash flow. Most recently, Tareq, Ong and Abdul Halim (2026), using 338 Malaysian firms and 747 firm-year observations from 2018 to 2023, reported that ESG performance alone did not significantly improve firm outcomes and was negatively associated with market valuation in their specification, while FTSE4Good recognition strengthened the ESG-market performance relationship. The Malaysian literature therefore points to contingencies rather than a universal ESG premium.

This lack of uniformity increases the relevance of disclosure quality. A company can disclose extensively without disclosing decision-useful information. It can also demonstrate strong sustainability performance but fail to explain that performance in a way that investors can connect to future cash flows, risk and strategic resilience. Fatemi, Glaum and Kaiser (2018) found internationally that ESG strengths enhance value and weaknesses reduce it, but that disclosure modifies the valuation

consequences of both strengths and weaknesses. Khan et al. (2016) further suggest that materiality is critical. These insights support a distinction among ESG activity, ESG performance, ESG disclosure volume, disclosure quality and external credibility. Treating these concepts as interchangeable can obscure the mechanisms through which sustainability affects firm value.

Sustainability assurance is one mechanism for addressing credibility concerns. Assurance can increase confidence that reported metrics, processes and claims are supported by appropriate evidence and controls. Yet sustainability assurance is itself an evolving professional field. Yan et al. (2022) conceptualise assurance as a process involving provider selection, identification, screening, validation and evaluation, highlighting that assurance quality depends on far more than the existence of an assurance statement. Boiral et al. (2024) show that market participants can remain sceptical about assurance when verification practices are vague, expertise is limited, costs are high or underlying ESG data remain unreliable. This is particularly relevant in Malaysia because the assurance timetable is being phased with the NSRF. On 17 September 2026, the Advisory Committee on Sustainability Reporting announced that mandatory reasonable assurance over Scope 1 and Scope 2 greenhouse-gas disclosures for Group 1 entities would commence for reporting periods beginning on or after 1 January 2028 rather than 2027, with Group 2 and Group 3 also shifted by one year (SC, 2026). The announcement followed a review of the first cohort of 91 Group 1 issuers reporting under ISSB-aligned requirements, which identified the need for further improvement in disclosure quality. The decision is significant: it recognises that assurance quality ultimately depends on reporting maturity, evidence, systems and controls.

This paper addresses four related questions. First, how has Malaysia's ESG reporting architecture evolved from broad sustainability disclosure toward ISSB-aligned sustainability-related financial reporting? Second, what does Malaysian empirical evidence suggest about the relationship between ESG and firm value or financial performance? Third, how do greenwashing risk, board governance and sustainability assurance affect the credibility of that relationship? Fourth, what conceptual and empirical research agenda is most relevant during the NSRF implementation period? To answer these questions, the paper uses a critical review of academic literature and Malaysian regulatory sources and develops a conceptual framework integrating stakeholder theory, signalling theory, agency theory, and resource-based and dynamic capability perspectives.

The paper makes three contributions. First, it updates the Malaysian ESG discussion to reflect the NSRF and the September 2026 assurance decision. Second, it distinguishes ESG performance from ESG disclosure quality, helping to explain why empirical findings differ across samples, measures and periods. Third, it develops a Malaysia-specific conceptual framework that integrates board governance, assurance, greenwashing risk and MSME supply-chain implications. The empirical literature reviewed in this paper does not establish that ESG inevitably creates value; rather, it identifies mixed and conditional associations. The proposed relationships in Section 7 are therefore conceptual propositions for future empirical testing.

2. ESG in the Malaysian Corporate and Economic Context

Malaysia's ESG landscape must be interpreted within the structure of its economy and capital market. The country is deeply integrated into regional and global supply chains, especially in electrical and electronics manufacturing, commodities, energy, financial services and increasingly digital industries. Such integration creates exposure to external sustainability expectations, including emissions reporting, labour standards, supply-chain due diligence, responsible sourcing and investor screening. For an export-oriented economy, ESG capability is therefore linked not only to domestic regulation but also to continued access to international customers, financing and investment.

Bursa Malaysia has developed sustainability requirements progressively. The exchange's Sustainability Reporting Guide explains the business case for embedding sustainability and provides guidance for listed corporations preparing their Sustainability Statements in accordance with the Listing Requirements (Bursa Malaysia, 2022). The enhanced framework introduced common material sustainability matters such as anti-corruption, community and society, diversity and inclusion, energy management, health and safety, labour practices and standards, supply-chain management, data privacy and security, water, waste and emissions management. It also emphasised indicators, targets and multi-year data. This represented a move away from purely narrative disclosure toward comparable performance information.

Corporate governance is another central component of Malaysia's ESG system. The Malaysian Code on Corporate Governance 2021 strengthened expectations regarding board and senior-management responsibility for sustainability risks and opportunities (SC, 2021a). It also recommends that boards comprise at least 30 per cent women directors and expects boards below that level to explain concrete actions and timeframes. These provisions connect the 'G' in ESG directly to the quality of environmental and social oversight. ESG reporting is not merely a communication function; it depends on governance structures capable of challenging assumptions, defining risk appetite, allocating capital and monitoring performance.

Malaysia's financial-sector climate architecture further expands ESG expectations. Bank Negara Malaysia's Climate Change and Principle-based Taxonomy (CCPT) provides a framework for financial institutions to assess and classify economic activities in relation to climate mitigation, adaptation and transition (BNM, 2021). The Climate Risk Management and Scenario Analysis policy document sets principles and requirements for financial institutions to strengthen resilience against climate-related risks and facilitate an orderly transition (BNM, 2022b; revised 2025). Through financing decisions, credit assessment and engagement, financial institutions can transmit sustainability expectations to borrowers that are not themselves publicly listed.

Recent events underline that climate disclosure is becoming more operational. In September 2026, the Securities Commission indicated that it intended to seek information from major listed companies on their preparedness for El Nino conditions, reflecting concern about drought and heat exposure, including in the palm-oil sector (Reuters, 2026). The example is useful because it demonstrates what investor-useful climate reporting should accomplish. A generic statement that climate change is a risk is of limited decision value. Investors need to understand exposure, sensitivity, adaptation measures, financial effects, scenario assumptions and the resilience of strategy. IFRS S2's governance, strategy, risk management, metrics and targets architecture is designed to push disclosures in this direction.

This broad institutional ecosystem means that ESG in Malaysia should not be viewed as a single regulation. It is an interlocking system involving capital-market disclosure, board governance, banking supervision, taxonomies, climate-risk management, index recognition, carbon markets, national energy transition, supply chains and SME capability building. The NSRF sits at the centre of the reporting layer, but the quality of its implementation will depend on how these components interact.

Table 1. Key Malaysian ESG reporting and governance milestones

Year	Milestone	Why it matters for this paper
2021	Malaysian Code on Corporate Governance (MCCG) updated to strengthen board leadership and oversight of sustainability.	Provides the governance foundation linking board accountability with ESG oversight and disclosure quality.

2022	Bursa Malaysia issued the 3rd edition of the Sustainability Reporting Guide and enhanced climate-related reporting expectations.	Signals the transition from broad narrative sustainability reporting toward more structured metrics and climate information.
2024	National Sustainability Reporting Framework (NSRF) launched, using IFRS S1 and IFRS S2 as the baseline sustainability disclosure standards in Malaysia.	Creates the core institutional setting for analysing disclosure quality, greenwashing risk and firm-value implications.
2025	ACSR/SC issued board-transition guidance and a practical approach to non-compliance during the reporting transition.	Shows that implementation depends on capability-building, governance maturity and regulatory supervision.
2026	Mandatory reasonable assurance for Scope 1 and Scope 2 GHG disclosures was deferred, with Group 1 taking effect in 2028.	Highlights that data quality and reporting-system readiness remain central concerns under Malaysia's ESG regime.

Source: Compiled by the author from Securities Commission Malaysia (2021a, 2021b, 2024a, 2025a, 2025b, 2026) and Bursa Malaysia (2022).

Table 1 summarises the main milestones that shape the Malaysian ESG environment discussed in this paper. Together, these milestones show that Malaysia's ESG architecture has evolved incrementally rather than through a single rule change.

3. From Sustainability Narratives to the National Sustainability Reporting Framework

The launch of the NSRF on 24 September 2024 marked a major change in Malaysia's sustainability-reporting architecture. The framework uses IFRS S1 and IFRS S2 as the baseline for sustainability-related financial disclosures and was designed to improve consistency, comparability and reliability for investors and other stakeholders (SC, 2024a). Malaysia thereby aligned itself with a growing global movement toward ISSB-based reporting. The IFRS Foundation reports that jurisdictions across major regions are adopting or otherwise using the ISSB Standards, with Malaysia included among jurisdictions for which a formal profile has been published (IFRS Foundation, 2026a).

The distinction between conventional sustainability reporting and sustainability-related financial disclosure is important. Broad sustainability reporting can address an organisation's impacts on people, society and the environment from multiple stakeholder perspectives. IFRS S1 and IFRS S2 focus specifically on information material to users of general-purpose financial reports when they decide whether to provide resources to an entity. Under IFRS S1, material sustainability-related risks and opportunities are those that could reasonably be expected to affect cash flows, access to finance or cost of capital over time (IFRS Foundation, 2023a). IFRS S2 applies this logic to climate-related risks and opportunities and builds on the governance, strategy, risk-management, metrics-and-targets structure associated with the Task Force on Climate-related Financial Disclosures (IFRS Foundation, 2023b).

The NSRF adopts a phased approach. Large Main Market listed issuers with market capitalisation of RM2 billion and above began using the ISSB Standards from 2025 as Group 1. Other Main Market issuers follow as Group 2 from 2026, while ACE Market issuers and large non-listed companies with annual revenue of RM2 billion and above enter as Group 3 from 2027 (SC, 2024a, 2025a). The phase-in acknowledges that readiness varies substantially across the corporate sector. Group 1 companies generally have more sophisticated governance, investor-relations functions, data systems and access to

professional support than smaller issuers, although even large firms face significant challenges in producing connected and assured sustainability-related information.

The climate-first approach is particularly significant. Malaysia chose to begin with climate disclosures before expanding to the full range of sustainability-related topics. This reflects both investor demand and the relative maturity of climate reporting under existing Bursa Malaysia and BNM requirements. It also recognises that climate is an unusually cross-functional risk. Emissions data may be managed by sustainability teams, energy data by operations, capital expenditure by finance, physical-risk data by risk management, insurance exposure by treasury and supply-chain emissions by procurement. IFRS S2 requires these data streams to support a coherent explanation of climate-related risks and opportunities and their effects on strategy and financial prospects.

The framework also changes the expected role of boards. The SC's 2025 guidance for boards emphasises governance, sustainability data boundaries, financial impact assessments and integration with enterprise risk management (SC, 2025a). This is consistent with the MCCG's earlier emphasis on board responsibility for sustainability (SC, 2021a). The progression is important: boards are expected not simply to approve a sustainability report but to understand the systems that produce sustainability information and the strategic assumptions behind it. Questions about emissions boundaries, scenario analysis, materiality, transition plans and targets can affect investment decisions, financing and risk appetite. Therefore, ESG oversight increasingly resembles oversight of other financially relevant corporate information.

The evolution toward standardised metrics can improve comparability but also exposes data-quality weaknesses. Bursa Malaysia's Sustainability Reporting Guide already requires listed corporations to manage and report material sustainability matters, use indicators and provide multi-year performance data as requirements phase in (Bursa Malaysia, 2022). The ISSB framework increases expectations around connectivity to financial reporting. A climate target, for example, should not exist in isolation from capital expenditure, asset lives, impairment assumptions, procurement strategy or financing plans if those financial elements are affected by the target. The discipline of connectivity can reveal inconsistencies between public sustainability commitments and internal resource allocation.

This shift has implications for the concept of materiality. In ESG debates, companies sometimes disclose what is easiest to measure or most favourable to communicate. IFRS S1 instead asks whether information could reasonably be expected to influence decisions of users of general-purpose financial reports. Khan et al. (2016) provide important empirical support for the economic relevance of financially material sustainability topics. Their study found stronger performance associations for material sustainability issues than for immaterial ones. In Malaysia, a disciplined materiality process can therefore help firms avoid both under-disclosure of financially important risks and overproduction of low-value narrative information.

A critical issue is Scope 3 emissions. Scope 1 emissions arise from sources owned or controlled by the company, while Scope 2 relates to purchased energy; Scope 3 covers other value-chain emissions. For many businesses, Scope 3 is the largest category but also the most difficult to measure because it depends on suppliers, customers, transport, product use, waste and other external data. Malaysia's decision to phase Scope 3 requirements reflects the complexity of obtaining reliable data. The challenge is especially acute for companies with large supplier networks of MSMEs. As a result, ESG capability-building must extend beyond the reporting entity. Programmes such as BNM's Greening Value Chain initiative and SME Corp's ESG tools can be viewed as enabling infrastructure for future corporate reporting rather than isolated SME programmes (BNM, 2022a, 2023; SME Corporation Malaysia, 2024).

Sustainability assurance adds another layer of discipline. Assurance is intended to increase confidence in reported information, but the value of assurance depends on the maturity of data, methodologies and

controls. Malaysia's September 2026 assurance decision is therefore instructive. The ACSR deferred mandatory reasonable assurance over Scope 1 and Scope 2 greenhouse-gas disclosures for Group 1 entities to reporting periods beginning on or after 1 January 2028; Group 2 and Group 3 requirements move to 2029 and 2030 respectively (SC, 2026). The decision followed a review of the first 91 Group 1 listed issuers applying the ISSB Standards and recognised that disclosure quality requires further improvement. The deferral should not be interpreted as a retreat from assurance. Rather, it highlights that credible assurance cannot compensate for weak data architecture or immature reporting processes.

The NSRF thus creates both opportunity and pressure. The opportunity lies in reducing fragmentation and allowing Malaysian companies to communicate sustainability-related financial risks and opportunities in a globally recognisable format. This can support investor comparison, access to capital and strategic discipline. The pressure arises because high-quality ISSB reporting is resource-intensive and exposes weaknesses in data, governance and enterprise integration. The next sections examine why these implementation differences matter for firm value, greenwashing risk and the credibility of ESG claims.

Table 2. NSRF phased implementation and sustainability assurance schedule

Reporting cohort	First mandatory ISSB/NSRF reporting year	Scope 3 transition relief	First mandatory reasonable assurance year for Scope 1 & 2 GHG disclosures
Group 1: Main Market listed issuers with market capitalisation of RM2 billion and above	2025	Deferred beyond the initial climate-first phase under NSRF transition reliefs	2028
Group 2: Other Main Market listed issuers	2026	Deferred beyond the initial climate-first phase under NSRF transition reliefs	2029
Group 3: ACE Market listed issuers and large non-listed companies (annual revenue of RM2 billion and above)	2027	Deferred beyond the initial climate-first phase under NSRF transition reliefs	2030

Source: Securities Commission Malaysia (2024b, 2026).

The phased schedule in Table 2 clarifies that Malaysia is combining an early move to ISSB-based reporting with a more gradual transition to mandatory reasonable assurance. This sequencing is central to the paper's argument that disclosure quality depends on both regulatory ambition and organisational readiness.

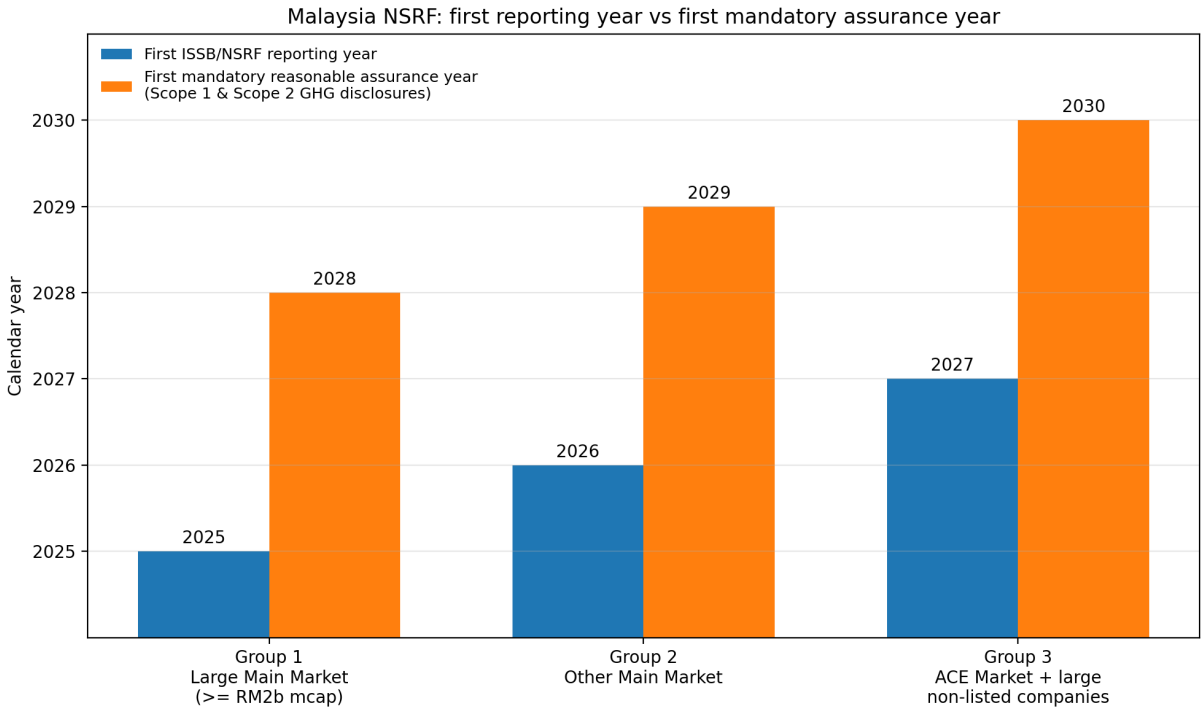

Figure 1. Malaysia NSRF: reporting and assurance schedule by reporting cohort

Source: Author-generated chart based on Securities Commission Malaysia (2024b, 2026).

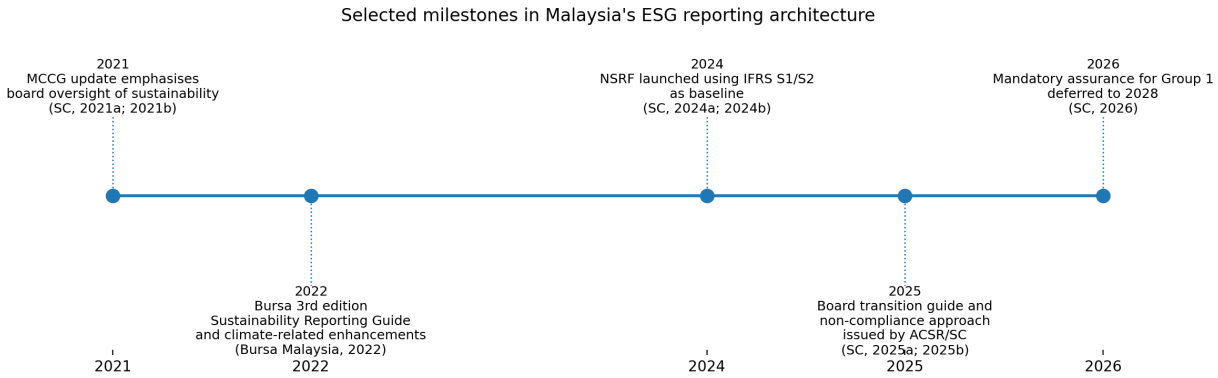

Figure 2. Selected milestones in Malaysia's ESG reporting architecture

Source: Author-generated timeline based on Securities Commission Malaysia (2021a, 2021b, 2024a, 2025a, 2025b, 2026) and Bursa Malaysia (2022).

4. Theoretical Foundations for Understanding ESG Disclosure Quality and Firm Value

The relationship between ESG disclosure and firm value is theoretically complex because sustainability reporting can serve several functions at the same time. It can reduce information asymmetry, respond to stakeholder demands, signal superior management quality, protect organisational legitimacy, satisfy institutional pressure or, in less favourable cases, provide symbolic communication without equivalent operational change. No single theory fully explains these possibilities. A multi-theoretical perspective is therefore more appropriate for the Malaysian setting.

4.1 Stakeholder theory

Stakeholder theory begins from the idea that firms depend on relationships with multiple constituencies rather than shareholders alone. Employees, customers, suppliers, regulators, communities, lenders and

investors can all affect the firm's ability to create and preserve value. ESG issues are particularly compatible with this perspective because environmental and social externalities can alter the quality of stakeholder relationships and ultimately affect reputation, operating continuity and access to resources. In Malaysia, stakeholder pressure can come from domestic regulators, international customers, institutional investors, Islamic capital-market participants, banks and multinational supply chains.

From a stakeholder perspective, high-quality ESG disclosure can strengthen relationships by reducing uncertainty about how the company manages material sustainability matters. For employees, social disclosures may reveal health and safety performance, labour practices or diversity. For lenders, climate and transition information can affect risk assessment. For customers, responsible sourcing or emissions data may influence supplier selection. For regulators, data quality affects confidence that sustainability rules are being implemented meaningfully. The value of disclosure therefore depends not only on quantity but on whether it addresses stakeholder information needs in a credible way.

4.2 Signalling theory

Signalling theory is especially useful for understanding ESG disclosure in capital markets. Managers possess information about organisational quality, risk management and future prospects that outside investors cannot observe directly. Disclosure can reduce this information gap, but only if the signal is sufficiently costly or credible to distinguish stronger firms from weaker ones. ESG disclosure that consists of generic statements may be a weak signal because almost any firm can produce such language. Quantified targets, consistent time-series data, external ratings and assurance can make signals more credible.

This logic is consistent with Malaysian evidence. Wong et al. (2021) found that ESG certification was associated with lower cost of capital and higher Tobin's Q among Malaysian firms, suggesting that external recognition may provide information beyond voluntary self-reporting. Tareq et al. (2026) similarly found that F4GBM inclusion strengthened the ESG-market performance relationship. Under signalling theory, external recognition can reduce uncertainty because investors do not have to rely solely on corporate claims. Assurance can perform a similar role when it verifies metrics or reporting processes.

However, signalling theory also explains why greenwashing is damaging. If sustainability claims are later shown to be exaggerated or inconsistent with performance, the signal loses credibility. Market participants may then discount not only the disputed statement but also future ESG disclosures from the firm. Zhou (2024) found that environmental disclosure greenwashing can reduce the valuation premium associated with environmental information through diminished market trust. In this sense, greenwashing is not merely an ethical concern; it can undermine the economic function of disclosure.

4.3 Agency theory

Agency theory focuses on conflicts between managers and providers of capital and the role of monitoring and disclosure in reducing agency costs (Jensen & Meckling, 1976). ESG creates several possible agency problems. Managers may underinvest in long-term sustainability because benefits occur beyond their performance horizon. Alternatively, managers may overinvest in visible ESG initiatives that improve personal reputation but do not create shareholder value. They may also selectively disclose favourable outcomes and hide adverse information. Effective governance is therefore necessary to ensure that sustainability strategy and reporting are aligned with long-term organisational interests.

Board independence and expertise are central in this framework. Kamaludin et al. (2022) found that board independence and board diversity were positively associated with ESG disclosure among Malaysian companies. The MCCG 2021 also strengthens the board's role in sustainability oversight (SC,

2021a). A board capable of questioning management assumptions can improve the quality of ESG targets, challenge unsupported claims and ensure that sustainability investments are connected to strategy and risk.

4.4 Resource-based and dynamic capability perspectives

The resource-based view and dynamic capabilities perspective offer a strategic interpretation. ESG capability can be treated as an organisational competence involving data systems, board oversight, cross-functional coordination, stakeholder engagement and the ability to adapt strategy as sustainability risks evolve. Eccles et al. (2014) found that high-sustainability companies developed distinctive organisational processes such as board oversight, stakeholder engagement and long-term orientation. These capabilities can be difficult to imitate because they depend on routines, culture and coordination rather than a single policy.

Together, these theories provide complementary conceptual mechanisms through which ESG disclosure may be related to firm value. Disclosure may reduce information asymmetry and signal management quality, stakeholder trust may protect important operating relationships, governance and assurance may constrain opportunistic disclosure, and organisational capabilities may influence whether sustainability commitments are translated into operational action. These mechanisms organise the literature review and motivate the propositions developed later; they are not empirical findings established by this paper.

5. Review of Empirical Evidence in Malaysia

5.1 ESG disclosure and corporate financial performance

The Malaysian empirical literature does not support a single unconditional relationship between ESG and financial performance. Atan et al. (2018) found no significant association between individual or aggregate ESG factors and profitability or firm value for 54 Malaysian public listed companies over 2010-2013. Their findings are important because they challenge the assumption that ESG automatically improves accounting returns or market valuation. The period studied also preceded many of Malaysia's more recent sustainability-reporting reforms, which means ESG information and investor awareness were less mature than today.

Wan Mohammad and Wasiuzzaman (2021) reached a more positive conclusion using a much larger sample of 3,966 firm-year observations from 661 Bursa Malaysia companies for 2012-2017. They found that ESG disclosure improved firm performance even after controlling for competitive advantage and reported a positive relationship between environmental disclosure and firm performance. Their study supports the view that transparency and sustainability engagement can contribute to value creation in an emerging market. However, the authors also highlight the importance of context and financing incentives, suggesting that policy design can influence the economic consequences of ESG adoption.

Wong et al. (2021) examined third-party ESG certification and found that Malaysian firms experienced a reduction in cost of capital and an increase in Tobin's Q after receiving ESG ratings. The study is particularly relevant to disclosure credibility because certification introduces an external evaluative layer. It suggests that investors may value not just corporate sustainability activity but also the reduction in information uncertainty provided by external recognition.

Yip and Lau (2024) add important nuance. Using 72 F4GBM companies from 2014 to 2022, they found a positive and significant relationship between ESG practice and firm performance, but the benefits were conditional. The positive effect was stronger among firms with high market capitalisation and high free cash flow, while higher liabilities reduced the positive impact. This suggests that ESG strategies may

require financial slack and organisational capacity. Firms under financial pressure may find it harder to convert sustainability initiatives into observable market benefits.

The most recent evidence reinforces the importance of contingencies. Tareq et al. (2026) analysed 338 Bursa Malaysia firms from 2018 to 2023 and found that ESG performance by itself did not significantly improve financial outcomes and was negatively associated with market valuation in their model. They found that F4GBM index recognition positively moderated the ESG-Tobin's Q relationship, while Shariah compliance did not significantly moderate it. Their findings are useful because they demonstrate that the Malaysian ESG-value relationship remains dynamic even after sustainability reporting became more prominent.

Taken together, the literature suggests at least five reasons for mixed results. First, studies use different ESG measures, including Bloomberg scores, disclosure indexes, composite ratings and index membership. Second, performance measures differ, with studies using ROA, ROE, Tobin's Q, cost of capital or market returns. Third, sample periods span major regulatory changes, making older and newer observations institutionally different. Fourth, firm characteristics such as size, leverage and cash flow affect the ability to implement ESG. Fifth, disclosure credibility and external recognition can change how investors interpret ESG information. These factors support a research focus on disclosure quality rather than only aggregate ESG scores.

5.2 Board governance and ESG outcomes

Governance is both one pillar of ESG and a mechanism through which environmental and social performance is managed. Malaysia's regulatory architecture places substantial responsibility on boards, particularly after the MCCG 2021 strengthened sustainability oversight expectations (SC, 2021a). Empirical studies generally support a connection between board characteristics and ESG disclosure, although individual proxies do not produce consistent findings.

Kamaludin et al. (2022) studied Malaysian listed companies over 2006-2020 and found that board independence and gender diversity significantly enhanced ESG disclosure, while greater board meeting frequency was negatively related to disclosure. Their sectoral and time analyses indicated that board effects became more pronounced after sustainability regulation strengthened. The finding on meeting frequency demonstrates why observable governance structures can be imperfect proxies: more meetings may indicate stronger oversight, but they may also reflect inefficiency or crisis response.

Latif et al. (2020) examined board diversity and environmental reporting in Malaysia and found that some dimensions of board composition and firm characteristics influenced environmental disclosure, while disclosure itself did not necessarily predict future performance. The study demonstrates that governance affects ESG reporting through multiple channels and that stronger disclosure does not guarantee immediate financial consequences.

The practical implication is that governance quality should be measured in substantive terms. Relevant variables may include whether sustainability responsibility is explicitly assigned to the board; the existence and composition of a sustainability committee; director climate or ESG expertise; integration of sustainability into enterprise risk management; executive remuneration linked to material ESG targets; and the quality of board challenge over targets and assumptions. These measures may explain disclosure quality better than board size or meeting counts alone.

5.3 Climate disclosure and investor response

Climate-related reporting has become one of the most financially significant elements of ESG in Malaysia. Pandey, Al-ahdal, Moussa and Hashim (2025) studied the stock-market reaction to Bursa Malaysia's announcement of mandatory climate-related disclosure using 412 listed firms. They

documented an initial negative market reaction and evolving cumulative effects across the event window. The study does not identify a single cause for the reaction; the observed market response may reflect expectations about compliance costs, transition risk, information revelation or future strategic adjustments.

5.4 Greenwashing and disclosure credibility

Kishan and Azhar (2025) provide one of the most relevant Malaysia-specific studies. They examined two forms of greenwashing, readability and tone, in 292 firm-year sustainability reports from Malaysian companies that remained among the top 100 by market capitalisation from 2019 to 2022. Their findings did not support the proposition that inferior sustainability performers systematically produced more readable or misleadingly positive reports. This evidence is valuable because it tempers generalised accusations of greenwashing in Malaysian corporate reporting.

At the same time, their study explicitly focuses on two forms of greenwashing, leaving other forms for future research. For example, firms may disclose emissions intensity while absolute emissions rise, highlight renewable-energy purchases without explaining total energy demand, or announce long-term net-zero targets without interim capital-allocation plans. They may also change reporting boundaries or measurement methods in ways that complicate year-to-year comparison. Under ISSB-aligned reporting, these issues become material because investors need consistent information connected to enterprise prospects.

5.5 Sustainability assurance and ESG data quality

Malaysia has experience with voluntary sustainability assurance, but the NSRF introduces a more structured path toward mandatory assurance. Earlier Malaysian research by Janggu et al. (2013) examined assurance statements and found variability in reporting practices, although assurance providers performed several validation activities. That early evidence foreshadowed the present challenge: the existence of an assurance statement does not by itself guarantee comparability or high assurance quality.

SC (2026) reported that its review of the first 91 Group 1 reporters identified areas where disclosure quality required further improvement and that mandatory reasonable assurance would be deferred. This regulatory evidence is established. The interpretation offered in this paper is that the deferral signals the importance of reporting maturity, evidence, systems and controls before reasonable assurance becomes mandatory. Accordingly, the recommendation that companies strengthen controls before the assurance deadline is a practical implication of the review rather than an empirically tested effect.

5.6 ESG, Shariah compliance and Islamic finance

Malaysia's Islamic capital market creates a distinctive research setting because Shariah-compliant status and ESG can interact without being equivalent. Both frameworks value ethical behaviour and social responsibility, but ESG includes topics that are not fully captured by Shariah screening. A company may be Shariah-compliant while still having weak emissions management, board diversity, cybersecurity, labour practices or climate-risk governance. Conversely, a strong ESG company may not qualify as Shariah-compliant because of its business activities or financial ratios.

Nik Asni et al. (2024) found a positive relationship between ESG disclosure and firm performance and reported that Shariah-compliant status strengthened this relationship in their Malaysian sample. Lee (2024) similarly found that Shariah screening positively moderated the corporate sustainability practice-financial performance relationship, although corporate controversies weakened the relationship. Ma'in et al. (2025), examining Malaysian Shariah-listed companies over 2010-2021,

reported that ESG did not significantly affect market performance measured by Tobin's Q, while environmental performance was more relevant to ROA. Tareq et al. (2026) did not find a significant moderating role for Shariah compliance.

5.7 ESG and Malaysian MSMEs

The policy challenge is proportionality. Large-company reporting requirements cannot simply be imposed on micro and small firms without considering capacity and cost. At the same time, excluding MSMEs entirely would weaken value-chain data and could reduce their competitiveness in export markets. A tiered approach is therefore necessary: simplified metrics, common templates, digital tools and transition finance can help suppliers respond to customer requests without creating excessive administrative burden. BNM's Greening Value Chain programme is an example of this enabling approach because it combines technical guidance, emissions measurement and financing support (BNM, 2022a, 2023).

Table 3. Selected findings from Malaysian ESG studies reviewed in this paper

Study	Sample / context	Main finding	Implication for this paper
Atan et al. (2018)	54 Malaysian PLCs	No significant relationship was found between individual or aggregate ESG factors and ROE or Tobin's Q.	Challenges the assumption of a universal positive ESG-performance relationship.
Wan Mohammad & Wasiuzzaman (2021)	3,966 firm-year observations in Malaysia	ESG disclosure, competitive advantage and firm performance were positively associated.	Indicates that disclosure and strategic positioning may be associated with firm performance.
Wong et al. (2021)	Malaysian firms with ESG certification	ESG certification was associated with a lower cost of capital and higher Tobin's Q.	Highlights the potential signalling and credibility role of external ESG recognition.
Yip & Lau (2024)	72 FTSE4Good Bursa Malaysia companies, 2014-2022	ESG practice was positively associated with firm performance, with effects conditioned by market capitalisation, liabilities and free cash flow.	Shows that observed ESG-performance associations vary with firm-level conditions.
Kishan & Azhar (2025)	Malaysia sustainability-reporting context	The study did not find that inferior sustainability performers systematically produced more readable or misleadingly positive reports; it examined readability and tone as two forms of greenwashing risk.	Tempers generalised greenwashing claims and supports cautious, multi-indicator measurement of greenwashing risk.

Tareq et al. (2026)	338 Bursa Malaysia firms	ESG performance alone did not significantly improve financial outcomes and was negatively associated with market valuation in the study's specification; F4GBM recognition strengthened the ESG-Tobin's Q relationship, while Shariah compliance did not significantly moderate it.	Reinforces that ESG-value relationships are conditional and depend on the measure and institutional context.

Source: Compiled by the author from the studies cited in the paper.

Table 3 reports selected published empirical findings reviewed in Section 5. It does not establish a single causal relationship between ESG and firm value. The evidence is mixed: some studies report positive associations, while others report insignificant or conditional relationships. This mixed pattern provides the empirical basis for developing, but not confirming, the conceptual propositions in Section 7.

6. Critical Discussion: Opportunities and Challenges under the NSRF

6.1 Improving decision usefulness rather than increasing report volume

This section presents an interpretive synthesis of the reviewed literature and regulatory material; it does not report new empirical tests. The central opportunity created by the NSRF is greater decision usefulness rather than simply more ESG disclosure. Under IFRS S1 and IFRS S2, sustainability information is expected to be connected to enterprise prospects and useful to investors, lenders and other providers of capital (IFRS Foundation, 2023a, 2023b). This supports reporting that explains how material sustainability matters relate to strategy, risk, financing and financial planning.

Decision-useful disclosure should be specific. Where material, companies should identify the relevant physical or transition risk, time horizon, affected assets or operations, management response, key assumptions and expected financial effects. Likewise, workforce disclosures are more informative when supported by trend data on matters such as safety, turnover, training and critical skills rather than generic statements.

Preparing connected ISSB-aligned disclosure also requires coordination across finance, sustainability, risk, operations, legal, procurement, investor relations, human resources and internal audit. In this conceptual synthesis, such integration may improve internal consistency and decision-making when sustainability information is embedded in existing planning and risk processes.

6.2 Data architecture and internal controls

Data quality is a practical challenge because ESG information often originates from different systems, business units and third parties. Energy, emissions, workforce and supplier data may be produced using different sources and methods; without common definitions, ownership and controls, consolidation can become inconsistent.

A sustainability data architecture should therefore define material metrics, data owners, source systems, frequency, calculation methods, units, reporting boundaries, approvals and evidence requirements. Methodology changes should be documented, estimates distinguished from measured data, and reconciliations used where sustainability metrics connect with financial or operational information.

The 2026 assurance deferral provides additional preparation time. The reviewed regulatory material indicates that disclosure quality still requires improvement, so companies can use the transition period to strengthen evidence, controls and documentation before mandatory reasonable assurance over Scope 1 and Scope 2 emissions takes effect.

6.3 Scope 3 and supply-chain readiness

A potential competitiveness implication concerns value-chain data. Suppliers that can provide credible carbon and ESG information may be better positioned to respond to customers facing sustainability requirements. For Malaysian MSMEs, this suggests that practical support should connect sustainability reporting with procurement, energy management, financing and export requirements rather than treating it as stand-alone compliance.

6.4 The cost-benefit challenge

ESG implementation requires resources for activities such as systems, assurance, energy efficiency, governance and supply-chain assessment, while potential benefits may arise through risk management, operational savings, market access, reputation or financing. Because these costs and benefits vary by firm and issue, the literature does not support assuming an immediate or uniform financial return from all ESG investment.

Tareq et al. (2026) reported that ESG performance was associated with weaker market valuation in some specifications, while Yip and Lau (2024) found that market capitalisation, liabilities and free cash flow conditioned ESG-performance relationships. These findings support a materiality-based approach that prioritises sustainability issues most closely connected to business resilience, stakeholder expectations and financial outcomes.

This interpretation is consistent with Khan et al. (2016), who found stronger performance associations for financially material sustainability issues. The specific material issues will differ by industry; for example, a plantation company and a bank would not be expected to prioritise identical ESG topics.

6.5 Greenwashing, legal risk and communication discipline

From a communication perspective, stronger reporting expectations create a need for evidence-based claims. Environmental statements should specify boundaries, baselines, methodology and limitations, while targets should distinguish aspirations from committed plans. Carbon-neutrality claims should also explain the role of actual emissions reductions and offsets.

Malaysia's Bursa Carbon Exchange provides infrastructure for voluntary carbon credits and renewable energy certificates, including a Shariah-compliant market design (Bursa Carbon Exchange, 2025). In this paper's policy interpretation, companies using offsets should explain their quantity, quality, standard, vintage and role within the wider transition plan so that users can distinguish internal reductions from offset use.

Kishan and Azhar (2025) did not find that inferior sustainability performers systematically used more readable or misleadingly positive reporting in the sample they studied. Their findings therefore should not be used as evidence of widespread greenwashing in Malaysia. At the same time, the study focused on readability and tone, leaving other forms of disclosure-performance inconsistency open for future research.

6.6 Assurance capacity and professional judgement

The transition toward sustainability assurance also raises a capability issue. Greenhouse-gas accounting, climate scenarios, biodiversity, human capital and supply-chain metrics involve different

technical disciplines, so assurance engagements may require multidisciplinary expertise in addition to assurance methodology.

SC (2026) linked the assurance deferral to the need for further improvement in disclosure quality. This supports the practical interpretation that assurance readiness depends on consistent criteria, transparent assumptions, documented methodologies and sufficiently mature reporting systems.

Boards and audit committees should therefore understand what information is assured, the assurance level, the applicable standard and any exclusions. Limited assurance is not equivalent to reasonable assurance, and assurance over selected indicators is not assurance over an entire sustainability report.

6.7 Integration with financial reporting

The NSRF and ISSB emphasis on connectivity requires sustainability-related financial information to be considered alongside financial reporting. Climate transition plans may affect asset lives, impairment, provisions, capital expenditure and financing, while physical and social risks may have operational and financial consequences.

Where a company describes a material sustainability risk but related financial assumptions appear inconsistent, users may question the coherence of reporting. Finance functions therefore have an important role in connecting sustainability information with planning, risk management and financial reporting.

6.8 Malaysia's opportunity as an emerging-market reporting leader

Future evaluation of Malaysia's NSRF implementation should therefore look beyond the number of compliant reports. Relevant indicators could include the comparability of disclosures, explanation of financial effects, board oversight, emissions-data reliability, internal controls, assurance readiness and the ability of MSMEs to provide value-chain information.

7. Proposed Conceptual Framework and Research Propositions

Based on the theoretical and empirical review, this paper proposes a conceptual framework in which ESG disclosure quality is linked to firm value through information asymmetry, stakeholder trust and perceived risk management. Sustainability assurance and governance quality are proposed as positive moderators, while greenwashing risk is proposed as a negative moderator. Firm characteristics and institutional conditions may also influence these relationships. These relationships are derived from theory and the reviewed evidence; they are not empirically tested in this paper.

7.1 ESG disclosure quality and firm value

Disclosure quality is defined here as the extent to which ESG information is material, specific, comparable, consistent, balanced, connected to strategy and financial effects, and supported by reliable data. Conceptually, high-quality disclosure may reduce information asymmetry by helping investors assess risks and opportunities more accurately. Signalling theory suggests that detailed and verifiable disclosure may provide a more credible signal than generic ESG communication, while stakeholder theory suggests that transparency may strengthen relationships with providers of capital and other stakeholders.

The reviewed Malaysian evidence is consistent with a positive relationship under some conditions but does not establish it universally. Wan Mohammad and Wasiuzzaman (2021), Wong et al. (2021), Raja Ahmad et al. (2023) and Yip and Lau (2024) report findings consistent with value benefits, whereas Atan et al. (2018) and Tareq et al. (2026) show insignificant, negative or conditional results depending

on the measure and specification. This mixed evidence motivates Proposition 1 rather than confirming it.

Proposition 1: Higher ESG disclosure quality is positively associated with firm value among Malaysian listed companies, after controlling for firm characteristics and underlying ESG performance.

7.2 Sustainability assurance as a credibility moderator

Theoretically, assurance may strengthen the value relevance of ESG disclosure by reducing uncertainty about data reliability. From a signalling perspective, credible assurance may increase the cost of unsupported claims; from an agency perspective, it may strengthen monitoring. However, the literature also indicates that assurance quality depends on scope, level, provider competence and underlying systems (Yan et al., 2022; Boiral et al., 2024).

Malaysia's staged assurance requirement creates a natural setting for future research. Researchers can compare pre-assurance, voluntary-assurance and mandatory-assurance periods, or compare firms that adopt assurance early with firms that wait until required. The 2026 deferral creates an additional institutional event that may affect preparation strategies.

Proposition 2: Sustainability assurance positively moderates the relationship between ESG disclosure quality and firm value, such that high-quality disclosure has a stronger valuation effect when it is subject to credible external assurance.

7.3 Greenwashing risk as a negative moderator

Conceptually, greenwashing risk may weaken the signalling value of ESG disclosure if users perceive sustainability communication as selective or exaggerated. The Malaysian evidence of Kishan and Azhar (2025) does not indicate systematic greenwashing through readability and tone in their sample, so it does not establish Proposition 3. International evidence from Zhou (2024) is consistent with the proposed mechanism that greenwashing can erode market trust.

Greenwashing risk can be operationalised through gaps between disclosure and performance, controversy indicators, abnormal positive tone, target-performance inconsistency, or changes in reporting boundaries. Under ISSB reporting, researchers could also examine whether stated climate commitments are consistent with capital expenditure and transition-plan disclosures.

Proposition 3: Greenwashing risk negatively moderates the relationship between ESG disclosure quality and firm value.

7.4 Board governance as an enabling mechanism

Board governance is proposed as an enabling mechanism because board oversight may influence whether ESG reporting is embedded in strategy and controls or treated mainly as communication. Malaysian evidence links board independence and diversity to ESG disclosure (Kamaludin et al., 2022), while the MCCG strengthens sustainability oversight expectations (SC, 2021a). These observations motivate, but do not empirically confirm, Proposition 4.

Proposition 4: Stronger board sustainability governance is positively associated with ESG disclosure quality and strengthens the relationship between ESG disclosure quality and firm value.

The conceptual model can therefore be summarised as follows: ESG disclosure quality is the central explanatory construct and firm value is the principal outcome; information asymmetry, stakeholder trust and risk perception are proposed mediating mechanisms; sustainability assurance and board governance are proposed positive moderators; greenwashing risk is a proposed negative moderator;

and firm characteristics, Shariah status, F4GBM recognition, industry and NSRF implementation phase are contextual moderators or controls. All proposed paths require empirical testing.

8. Recommended Methodology for an Empirical Malaysian Study

A future empirical study based on this framework could use Bursa Malaysia Main Market companies over a period covering both pre-NSRF and early NSRF implementation, for example 2022-2028 once sufficient post-adoption observations become available. If the research is undertaken earlier, a shorter period such as 2022-2026 could be used for exploratory analysis, with limitations clearly stated. Financial firms may be analysed separately because they are subject to additional BNM climate requirements and have distinctive balance-sheet structures.

8.1 Sample and data sources

The sample could include all non-financial Main Market firms with available annual reports, sustainability reports and financial data. ESG disclosure data could be collected manually through content analysis or sourced from a commercial database such as LSEG/Refinitiv where available. Financial variables can be obtained from annual reports, Bloomberg, LSEG, Capital IQ or Bursa Malaysia data services. F4GBM membership can be obtained from Bursa Malaysia and FTSE Russell materials. Shariah status can be collected from the Securities Commission's Shariah-compliant securities lists.

A hand-collected disclosure-quality index would offer greater research contribution than relying only on a third-party ESG score. The index could be aligned with IFRS S1 and IFRS S2 and include dimensions such as governance, strategy, risk management, metrics and targets, financial effects, scenario analysis, emissions, data comparability, target specificity, balance and connectivity with financial statements. Each criterion could be scored using a defined rubric. Inter-coder reliability should be tested if more than one researcher performs content analysis.

8.2 Variables

Firm value can be measured using Tobin's Q because it captures market expectations relative to asset value and is common in Malaysian ESG research (Atan et al., 2018; Yip & Lau, 2024; Tareq et al., 2026). Accounting performance measures such as ROA or ROE can be used for robustness testing. Cost of capital is another important outcome because IFRS S1 explicitly links sustainability risks and opportunities to access to finance and cost of capital.

The key independent variable would be ESG disclosure quality. Separate E, S and G quality indexes can also be constructed. Sustainability assurance can be coded by whether assurance exists, assurance level, provider type and scope. Greenwashing risk could be measured through divergence between ESG disclosure scores and performance indicators, controversy data, linguistic analysis or target-performance gaps. Board governance could include independence, gender diversity, ESG expertise, sustainability committee presence and meeting characteristics.

Control variables should include firm size, leverage, profitability, growth, industry, firm age and year effects. Free cash flow can be included because Yip and Lau (2024) show that financial slack affects ESG benefits. F4GBM inclusion should be included given the moderating result reported by Tareq et al. (2026). Shariah status can be tested separately rather than assumed to be uniformly beneficial.

8.3 Econometric approach

A baseline panel regression can estimate the association between disclosure quality and firm value while controlling for unobserved firm effects and year effects. Fixed-effects estimation is likely appropriate when time-invariant firm characteristics are correlated with ESG practices, although model

selection should be supported by diagnostic tests. Standard errors should be clustered at the firm level to address serial correlation and heteroskedasticity.

Endogeneity is a major concern because high-value firms may have more resources to invest in ESG reporting, creating reverse causality. Several strategies can be used. Lagged ESG variables can reduce simultaneity. Propensity-score matching can compare similar firms with different disclosure quality. Instrumental variables may be used if a defensible instrument exists. Most importantly, the phased NSRF timetable provides an opportunity for difference-in-differences analysis. Group 1 firms can be compared with not-yet-treated firms around the 2025 implementation period, followed by Group 2 and Group 3 as the framework expands.

The difference-in-differences approach should test the parallel-trends assumption before treatment. Event-time coefficients can show whether effects emerge gradually. Researchers should also recognise that Group 1 firms differ systematically from smaller firms because classification is based partly on market capitalisation. Matching or weighting may be needed to improve comparability.

8.4 Measuring assurance effects

The staggered assurance timetable creates a second institutional opportunity. Voluntary early adopters can be compared with non-adopters, but selection bias must be considered because firms choosing assurance may already have stronger ESG systems. Once mandatory assurance begins, researchers can examine whether disclosure-quality improvements occur before the formal effective date, which would indicate anticipatory effects.

Assurance quality should not be measured as a simple binary variable if data permit. A richer measure can distinguish limited from reasonable assurance, Big Four audit firms from other providers, coverage of the entire report versus selected metrics, and whether GHG emissions are specifically included. This would align better with the literature that emphasises assurance scope and provider characteristics.

8.5 Measuring greenwashing risk

Greenwashing measurement is challenging because it attempts to identify divergence between communication and underlying reality. A robust Malaysian study could combine several indicators. First, linguistic analysis can measure positive tone, readability and specificity, building on Kishan and Azhar (2025). Second, an ESG disclosure-performance gap can compare disclosure quality with objective environmental or social outcomes. Third, controversy databases can identify adverse events inconsistent with corporate claims. Fourth, target credibility can be assessed by examining whether firms publish interim milestones and evidence of progress.

No single indicator should be treated as definitive proof of greenwashing. A composite risk score is more defensible if each component is transparently defined. Researchers should use cautious language such as 'greenwashing risk' or 'disclosure-performance inconsistency' unless intentional deception can be demonstrated.

9. Managerial and Policy Implications

The following recommendations are implications derived from the literature review and conceptual synthesis rather than estimated causal effects. For Malaysian boards, ESG can be governed as enterprise information rather than only as a public-relations product. Boards should understand which sustainability issues are financially material, how they relate to strategy and risk, and whether the underlying data are sufficiently reliable for external reporting. Board dashboards can therefore include both performance indicators and information-quality indicators, such as data completeness, estimation levels, unresolved control issues and progress toward assurance readiness.

Chief financial officers have an increasingly important role. IFRS S1 and S2 are sustainability disclosure standards, but their focus on financial effects means finance functions cannot remain peripheral. CFOs should help align sustainability metrics with planning, budgeting, capital expenditure and financial statements. They should also support controls over ESG data and ensure that assumptions used in climate or transition disclosures are consistent with relevant financial assumptions where appropriate.

For investors, the Malaysian literature suggests caution in interpreting aggregate ESG scores. The relationship between ESG and value depends on firm characteristics, financial capacity, external recognition and the nature of the ESG measure (Atan et al., 2018; Yip & Lau, 2024; Tareq et al., 2026). Investors should examine materiality, data quality, controversies, target credibility and assurance rather than assuming that a higher score automatically implies superior financial prospects.

For regulators, the phased NSRF approach should continue to balance ambition with capability. The September 2026 assurance deferral demonstrates responsive implementation (SC, 2026). Capacity-building programmes should focus on practical areas that determine reporting quality: GHG accounting, climate-scenario analysis, financial-effects assessment, data controls, Scope 3 estimation and board oversight. Guidance should also reduce unnecessary duplication between reporting frameworks.

Finally, Malaysian companies should treat ESG credibility as a strategic asset. Transparent disclosure of challenges may sometimes be more credible than consistently positive messaging. Investors understand that transition involves uncertainty, estimation and trade-offs. A report that clearly explains limitations, methodology and progress can build more trust than a highly polished report that avoids difficult information.

10. Conclusion

Malaysia is moving from broad sustainability reporting toward an ISSB-aligned system in which sustainability-related information is expected to be financially material, comparable, governed and increasingly assured. The NSRF is central to this transition and raises expectations for board oversight, risk management, data systems, financial connectivity, supply chains and assurance readiness.

The empirical literature reviewed in this paper does not show a universal positive relationship between ESG and firm value. Instead, Malaysian studies report positive, insignificant, negative and conditional associations depending on the ESG measure, performance measure, firm characteristics and institutional context. This mixed evidence supports closer attention to disclosure quality and credibility, but it does not by itself prove that better disclosure causes higher firm value.

The regulatory review also shows that sustainability assurance is being phased alongside reporting maturity. The September 2026 decision to defer mandatory reasonable assurance over Scope 1 and Scope 2 emissions reflects the need for further improvement in disclosure quality (SC, 2026). A practical implication is that companies can use the additional time to strengthen data architecture, controls and documentation rather than treating assurance as a substitute for sound reporting systems.

Building on the reviewed evidence and theory, this paper proposes that future Malaysian research test the relationships among ESG disclosure quality, assurance, governance, greenwashing risk and firm value. The phased NSRF implementation and staggered assurance timetable provide opportunities for empirical designs that compare reporting cohorts and periods, subject to appropriate controls and diagnostic testing.

Overall, ESG should not be treated as a guarantee of superior financial performance or as a stand-alone compliance label. The conceptual argument advanced in this paper is that economic relevance is more likely when sustainability-related risks and opportunities are integrated with strategy, governance,

operations and capital allocation. Whether the proposed relationships hold in Malaysia remains an empirical question for future research.

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RESEARCH ARTICLE

The Development of a Coaching Model to Enhance Inclusive Special Education Management Competencies and Creative Thinking Skills in Schools within the Service Areas of Phranakhon Rajabhat University

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ABSTRACT

This research aimed to: (1) investigate the current problems and needs related to inclusive special education management; (2) develop a coaching model to enhance competencies in inclusive special education management and creative thinking skills; and (3) evaluate the effectiveness of the developed coaching model by comparing participants' competencies and creative thinking skills before and after implementation. The study employed a Research and Development (R&D) approach integrated with mixed-methods research. The research process consisted of four phases: Analysis (R1), Development (D1), Implementation (R2), and Evaluation (D2). The participants comprised 30 mentor teachers and pre-service teachers majoring in Elementary Education at the College of Teacher Education, Phranakhon Rajabhat University, selected through purposive sampling, together with five experts who evaluated the developed model. Research instruments included an interview protocol, questionnaires, an inclusive special education management competency assessment, a creative thinking skills assessment, and focus group discussions. Quantitative data were analysed using mean, standard deviation, and t-test, while qualitative data were analysed using content analysis. The findings revealed that: (1) mentor teachers and pre-service teachers had limitations in their knowledge and skills related to inclusive special education management and expressed a need for a professional development approach emphasising authentic practice; (2) the developed coaching model consisted of four major components: principles, objectives, a five-step coaching process, and evaluation. The overall appropriateness of the model was rated at the highest level (M = 4.61); and (3) following implementation of the coaching model, participants demonstrated statistically significant improvements in both inclusive special education management competencies and creative thinking skills at the .05 level. The mean competency score increased from 2.83 before implementation to 4.32 after implementation, while the mean creative thinking skills score increased from 2.85 to 4.31. Participants also reported the highest level of satisfaction with the coaching model (M = 4.71). The findings indicate that the developed coaching model can be practically implemented in educational settings to strengthen inclusive special education management competencies while promoting creative thinking skills among mentor teachers and pre-service teachers.

Keywords: *Coaching Model; Inclusive Special Education; Teacher Competency; Creative Thinking; Inclusive Education*

1. Introduction

Education plays a fundamental role in preparing individuals to adapt to the complex demands of the twenty-first century, where lifelong learning, problem solving, creative thinking, adaptability, and respect for individual differences are increasingly essential. Within this context, inclusive education has become a key approach to promoting educational equity by ensuring that all learners, particularly those with special educational needs, can access, participate in, and benefit meaningfully from education. Rather than simply placing learners with special needs in mainstream classrooms, inclusion

requires educational systems, curricula, teaching practices, learning environments, and support mechanisms to respond effectively to learner diversity (UNESCO, 2020; Ainscow, 2020).

Thailand has continuously promoted educational opportunities for learners with special educational needs through legislation and national guidelines, including the Education Provision for Persons with Disabilities Act B.E. 2551 (2008). Nevertheless, a gap persists between policy and school-level implementation. Schools continue to encounter limitations in translating inclusive-education principles into school-level systems and classroom practices that respond effectively to learner diversity (Ainscow, 2020; UNESCO, 2020). Effective inclusive practice therefore depends substantially on teachers' professional competencies. Teachers must be able to analyse individual learner needs, develop and implement Individualized Education Programs (IEPs), differentiate instruction, use appropriate resources and assistive technologies, manage diverse classrooms, and design flexible learning opportunities consistent with Universal Design for Learning (UDL). Assessment must likewise move beyond uniform procedures towards authentic, individualised, and formative approaches that provide meaningful evidence of learner development (CAST, 2018; Black & Wiliam, 2018).

Developing such competencies requires more than conventional professional development based primarily on knowledge transmission. Inclusive classrooms involve complex and context-sensitive situations in which teachers must connect theory with authentic practice, experiment with instructional alternatives, receive constructive feedback, reflect on their decisions, and continuously improve their practice (Florian & Camedda, 2020). This challenge is particularly significant for pre-service teachers, who must translate university-based knowledge into practice during professional teaching experiences. Mentor teachers therefore play an important role in modelling professional practice, observing teaching, providing feedback, facilitating reflection, and supporting pre-service teachers in analysing and solving instructional problems; these functions are consistent with practice-based instructional coaching (Knight, 2018).

Educational coaching provides a promising mechanism for addressing these professional-development needs because it emphasises sustained, practice-based learning through goal setting, observation, questioning, constructive feedback, reflective dialogue, action planning, and continuous improvement (Knight, 2018). Evidence suggests that teacher coaching can improve instructional practice and student achievement by engaging teachers as active participants in identifying problems, generating solutions, testing alternatives, and evaluating their professional decisions (Kraft et al., 2018). Such processes are particularly relevant to inclusive education, where teachers frequently encounter diverse learner needs for which predetermined solutions may be insufficient.

Coaching is also closely connected with creative thinking, an important professional competence for responding adaptively to learner diversity. Inclusive classrooms require teachers to redesign activities, adapt instructional materials and technologies, modify learning environments and assessment approaches, and generate alternative pathways for student participation. Creative thinking enables teachers to examine problems from multiple perspectives, generate diverse possibilities, and refine instructional solutions according to evidence from practice (OECD, 2019). For mentor teachers and pre-service teachers, creativity should therefore be viewed not merely as an isolated cognitive skill but as an integral element of professional competence that enables inclusive principles such as IEPs, UDL, and differentiated instruction to be transformed into feasible and context-responsive practices.

Despite increasing attention to inclusive education, teacher professional development, educational coaching, and creative thinking, these areas have largely been investigated separately. Inclusive education research has primarily focused on principles and competencies for responding to learner diversity; coaching research has concentrated on general instructional improvement; and creative thinking research has frequently addressed student outcomes or broader twenty-first-century skills.

Consequently, there remains a need for an integrated professional-development model in which coaching serves as the developmental mechanism, inclusive special education management competency constitutes the professional target, and creative thinking supports adaptive and innovative professional practice. This need is particularly relevant to school-based practicum contexts, where mentor teachers and pre-service teachers collaboratively confront authentic challenges associated with learner diversity.

Accordingly, the present study develops and evaluates a coaching model to enhance inclusive special education management competencies and creative thinking skills in schools within the service areas of Phranakhon Rajabhat University. Integrating inclusive education principles, practice-based professional learning, coaching and reflective processes, and creative thinking, the model is intended to bridge university-based teacher preparation and authentic school practice. By examining existing problems and developmental needs, developing and validating the coaching model, and evaluating changes in participants' competencies and creative thinking skills, the study seeks to provide a theoretically grounded and practically applicable mechanism for strengthening inclusive educational practice.

2. Literature Review

2.1 Educational coaching

Educational coaching is a developmental process that aims to enhance individuals' potential through self-directed learning, powerful questioning, reflective dialogue, feedback, and continuous professional support rather than through direct instruction. Whitmore (2017) describes coaching as a process of unlocking an individual's potential by encouraging self-discovery and internal learning. Grant (2017) further views coaching as a structured and goal-oriented process involving goal setting, planning, self-regulation, and reflective conversation. In an educational context, Knight (2018) proposes the Impact Cycle, consisting of three major stages—Identify, Learn, and Improve—which emphasises collaboration between coaches and teachers in identifying instructional problems, learning appropriate strategies, and improving professional practice.

Educational coaching therefore represents more than a conversational technique. It is a systematic professional learning process that encourages teachers to analyse their own practice, examine evidence, generate alternative solutions, and continuously improve their instructional performance. Key features of educational coaching include deep listening, powerful questioning, constructive feedback, reflective practice, and collaborative problem solving. These processes allow teachers to become active agents in their own professional development rather than passive recipients of externally prescribed knowledge.

In contemporary teacher education, coaching is particularly valuable because it connects theoretical knowledge with authentic classroom experience. Through coaching, teachers and pre-service teachers can examine real instructional situations, identify challenges, test alternative approaches, and reflect on the consequences of their decisions. This practice-based orientation supports deeper professional learning and facilitates sustainable changes in instructional behaviour. The literature reviewed in the present study therefore positions educational coaching as an appropriate mechanism for developing professional competencies required for inclusive educational practice.

2.2 Coaching Process and Teacher Competency Development

The effectiveness of coaching depends substantially on the presence of a clear and systematic process. Coaching is generally conceptualised as a developmental cycle that includes goal setting, examination of current conditions, generation of possible alternatives, action, observation, feedback, and reflection. One of the most widely recognised approaches is Whitmore's (2017) GROW Model, which consists of four stages: Goal, Reality, Options, and Will. The model supports learners in identifying desired outcomes, analysing their current situation, exploring possible solutions, and committing themselves to action.

Other coaching frameworks similarly emphasise structured professional reflection. Grant (2017) proposes goal setting, planning, action, and evaluation as major elements of coaching, while Costa and Garmston's Cognitive Coaching approach incorporates planning conversations, observation, and reflective conversations. These processes encourage metacognition and enable practitioners to learn systematically from experience. Across the reviewed frameworks, the coaching process is consistently conceptualised as a structured and goal-oriented cycle rather than an informal conversation.

In relation to teacher professional development, coaching provides a personalised form of professional learning that is directly connected to classroom practice. Knight's (2018) Instructional Coaching approach emphasises collaborative goal setting, observation of instruction, reflection, and continuous improvement. Coaching also supports practice-based professional learning, reflective practice, and evidence-based decision making. In contrast to short-term professional training, coaching provides sustained support that responds to the individual developmental needs of teachers.

Consequently, coaching can contribute to teacher competency development by strengthening professional knowledge, instructional skills, self-awareness, reflective capacity, and professional attitudes. The literature reviewed for this study suggests that coaching is particularly effective when it is continuous, individualised, evidence-informed, and connected directly to authentic teaching practice.

2.3 Teacher Competency for Inclusive Special Education

Competency refers to an integrated capacity that enables individuals to apply knowledge, skills, attitudes, and personal attributes effectively in authentic situations. Contemporary competency frameworks emphasise that knowledge alone does not constitute codmpetence; rather, competence is demonstrated through an individual's ability to apply knowledge appropriately when addressing complex problems and professional tasks.

A common framework identifies three interrelated dimensions of competency: Knowledge, Skills, and Attitudes (K–S–A). Knowledge provides the conceptual foundation for professional decision making, skills represent the ability to apply knowledge in practice, and attitudes influence professional behaviour, motivation, and willingness to engage in continuous development. In teacher education, these dimensions are interdependent and collectively determine teachers' ability to respond effectively to changing educational contexts.

Teacher competency for inclusive special education requires an additional set of capabilities related specifically to learner diversity. Teachers need to understand individual differences and special educational needs, analyse learner characteristics, adapt instructional activities, manage inclusive classrooms, use appropriate learning resources and technologies, and collaborate with other professionals. Inclusive competency therefore extends beyond specialist knowledge and includes the capacity to design learning opportunities that enable all learners to participate meaningfully.

The concept of Inclusive Pedagogy emphasises designing learning experiences that accommodate all learners rather than separating students according to perceived ability or disability. Teachers are expected to create flexible learning alternatives that enable students to participate in common classroom activities without unnecessary labelling or segregation. The reviewed literature also highlights the importance of Differentiated Instruction, in which teachers adapt content, learning processes, and expected products according to learners' readiness, interests, and learning needs. These principles are central to teachers' ability to translate inclusive education from policy into classroom practice .

Collaboration represents another essential inclusive competency. Teachers must work effectively with special education teachers, parents, psychologists, administrators, and other specialists in planning and supporting individual learners. Such collaboration requires communication, coordination, shared

decision making, and a common understanding of learner needs. The reviewed literature therefore conceptualises inclusive special education competency as an integration of professional knowledge, instructional and collaborative skills, and positive attitudes towards learner diversity.

2.4 Inclusive Special Education

Inclusive education is grounded in the principles of equity, educational justice, human rights, and equal access to quality education. Contemporary perspectives regard learner diversity not as a problem to be corrected but as a fundamental condition to which education systems must respond. Inclusive education therefore involves more than placing students with special educational needs in mainstream classrooms. It requires systematic changes in educational structures, resource allocation, teacher development, school practices, instructional design, and assessment.

A central principle of inclusive education is that educational systems should adapt to learners rather than requiring learners to adapt to inflexible systems. Schools must therefore identify and reduce barriers to learning and participation and create environments in which all learners can access instruction, participate meaningfully, and achieve educational success. Inclusive education consequently involves both school-level systems and classroom-level instructional practices.

Current perspectives emphasise flexible and differentiated instruction as central to inclusive practice. Teachers may need to adapt content, learning processes, assignments, learning materials, technologies, and assessment approaches in response to individual learner differences. This creates a shift from providing isolated special services towards designing learning experiences that are accessible to everyone within the same educational environment.

High-quality inclusive education requires a coordinated system of governance, resource allocation, staff development, school-level support, and continuous monitoring. In the Thai context, particular emphasis has been placed on teacher development, instructional supervision, Individualized Education Programs (IEPs), appropriate learning media and technologies, professional learning communities, and collaboration with families and communities .

Thus, inclusive special education should be understood as a systemic approach designed to ensure access, participation, belonging, and educational achievement for learners with diverse needs. Its successful implementation depends heavily on teachers who are able to translate inclusive principles into flexible, responsive, and contextually appropriate classroom practices.

2.5 Creative Thinking Skills

Creative thinking refers to the capacity to generate, develop, evaluate, and refine ideas that are both novel and appropriate to a particular context. Contemporary perspectives regard creativity not as a fixed talent possessed by a limited number of individuals, but as a developmental capacity that can be strengthened through experience, problem solving, reflection, experimentation, and supportive learning environments.

Kaufman and Beghetto's Four-C Model of Creativity distinguishes different levels of creativity, ranging from personal meaning-making and everyday creativity to professional and eminent creative achievement. This perspective supports the view that creativity can be developed progressively within educational and professional contexts rather than being restricted to exceptional creative performance .

The literature reviewed in the study further indicates that creativity involves multiple interacting dimensions. These include cognitive processes, knowledge, personality, motivation, self-confidence, and environmental conditions. Creativity is therefore not simply the production of unusual ideas; it depends on the ability to connect knowledge, consider multiple perspectives, generate alternatives, evaluate

possibilities, and transform ideas into practical action. The reviewed literature particularly emphasises divergent thinking, knowledge integration, and learning through action as important dimensions of creativity in educational settings.

In the context of inclusive education, creative thinking is especially significant because teachers frequently encounter instructional problems for which standard solutions may not be sufficient. Teachers must be able to modify learning activities, redesign instructional materials, adapt technologies, vary assessment methods, and generate alternative pathways through which learners with different needs can participate successfully. Creative thinking therefore contributes directly to teachers' adaptive and innovative professional practice.

2.6 Creative Thinking in Teacher Professional Practice

Creative thinking is increasingly recognised as an important dimension of contemporary teacher professionalism. Teachers are expected not only to apply established instructional methods but also to design, adapt, and improve learning experiences in response to changing classroom conditions. This is particularly important in inclusive classrooms, where learners differ in readiness, abilities, communication patterns, interests, behaviour, and preferred modes of learning.

For teachers, creativity involves the ability to identify instructional problems, examine those problems from different perspectives, generate multiple possible responses, select appropriate solutions, test them in practice, and refine them on the basis of evidence. Creative professional practice may therefore appear in the design of learning activities, instructional materials, learning technologies, classroom environments, assessment tasks, or alternative forms of learner support.

The literature reviewed for this study suggests that teacher creativity is influenced by cognitive processes, motivation, self-efficacy, collaboration, and professional learning environments. Environments that provide psychological safety, opportunities for experimentation, meaningful technology use, collaborative professional learning, and reflective practice can support the development of creative teaching practices .

Educational coaching is closely related to this process because coaching encourages teachers to question assumptions, explore alternatives, reflect on evidence, and revise professional actions. Powerful questioning and reflective dialogue can stimulate teachers to move beyond habitual responses and generate new instructional solutions. Coaching can therefore serve not only as a mechanism for developing professional competency but also as a process for promoting creative thinking within professional practice.

2.7 Related Studies and Research Gap

Previous studies in Thailand indicate that coaching can contribute to the development of teacher competency, particularly in instructional practice, reflective thinking, self-development, and professional learning. Research combining coaching with practice-based approaches has demonstrated improvements in teachers' cognitive, interpersonal, and instructional competencies. Studies related to project-based learning, STEM education, technology-supported learning, and active learning have also reported positive effects on creative thinking, problem solving, and higher-order thinking. Taken together, these findings suggest that systematic teacher coaching and practice-oriented learning approaches have considerable potential to strengthen professional competence and creativity.

International studies similarly highlight the importance of systematic teacher development, flexible instructional design, and learning environments that respond to learner diversity. Research based on Inclusive Pedagogy suggests that effective inclusive teaching involves planning for all learners, designing

flexible classroom activities, and creating opportunities for students with different needs to participate together rather than providing separate learning experiences .

Taken together, the reviewed literature provides substantial support for three major propositions. First, coaching is an effective practice-based mechanism for teacher professional development. Second, successful inclusive education depends heavily on teachers' integrated knowledge, skills, attitudes, and ability to respond flexibly to learner diversity. Third, creative thinking enables teachers to generate and refine alternative instructional solutions when conventional approaches do not adequately address individual learning needs.

2.8 Positioning the Present Study

However, these three areas have commonly been investigated as relatively separate lines of research. There remains a need for an integrated professional development model in which coaching functions as the developmental process, inclusive special education management competency constitutes the primary professional outcome, and creative thinking supports adaptive and innovative professional practice. This gap is particularly relevant in teacher practicum contexts, where mentor teachers and pre-service teachers must collaboratively respond to authentic problems associated with learner diversity.

Accordingly, the present study integrates these theoretical and empirical foundations in developing a coaching model designed to strengthen inclusive special education management competencies while simultaneously promoting creative thinking skills among mentor teachers and pre-service teachers in schools within the service areas of Phranakhon Rajabhat University. The conceptual relationship underlying the study can be represented as follows:

Educational Coaching → Inclusive Special Education Management Competencies → Creative Thinking Skills → Enhanced Inclusive Educational Practice

3. Methodology

3.1 Research Design

This study employed a Research and Development (R&D) approach integrated with a mixed-methods research design. More specifically, an Exploratory Sequential Design was adopted, in which qualitative investigation was initially conducted to explore existing problems, developmental needs, and contextual conditions related to inclusive special education management. The qualitative findings were subsequently used as a foundation for developing the coaching model, research instruments, and quantitative evaluation procedures. This design enabled the researchers to integrate in-depth contextual evidence with quantitative findings in order to develop and evaluate a coaching model that was both theoretically grounded and practically applicable.

The R&D mixed-methods design was selected because the study had two complementary purposes: to develop a context-responsive coaching model from empirical needs and theoretical foundations, and to obtain preliminary evidence of changes following its implementation. The exploratory qualitative phase therefore informed model construction, while the quantitative pretest-posttest phase examined within-participant change. This design was intended for developmental evaluation rather than for establishing causal superiority over an alternative intervention.

The research process consisted of four sequential phases following the R1–D1–R2–D2 structure: Phase 1: Analysis (R1), Phase 2: Development (D1), Phase 3: Implementation (R2), and Phase 4: Evaluation and Refinement (D2). Each phase was systematically connected to the subsequent phase, allowing evidence obtained from the actual educational context to inform model development, implementation, evaluation, and final refinement.

3.2 Participants

The population of the study comprised mentor teachers and pre-service teachers involved in professional teaching practicum in schools implementing inclusive education, together with experts in special education and related fields. The research population included 75 mentor teachers and 75 pre-service teachers, while the participants for each research phase were selected through purposive sampling according to their roles, relevant experience, and suitability for the purposes of the study.

During Phase 1 (R1), 30 mentor teachers and pre-service teachers participated in the analysis of existing problems, needs, and contextual conditions associated with inclusive special education management. Participants were selected on the basis of their direct experience with inclusive education, willingness to participate, and ability to provide information concerning challenges and professional development needs.

Purposive sampling was used because participation in each phase required specific experience and roles directly relevant to inclusive education and the teacher-practicum context. The sampling strategy was therefore aligned with the developmental purpose of the R&D study: information-rich participants were selected for needs analysis, experts were selected for model validation, and implementation participants were selected because they could complete the coaching cycle in authentic inclusive settings. The sample was not intended to be statistically representative of all teachers or pre-service teachers; consequently, generalisation beyond comparable contexts should be made cautiously.

During Phase 2 (D1), five experts were purposively selected to evaluate the proposed coaching model and research instruments. The experts possessed qualifications and experience in special education, curriculum and instruction, teacher development, coaching, educational research, or educational measurement and evaluation.

For Phase 3 (R2), the implementation group consisted of 30 mentor teachers and pre-service teachers majoring in Elementary Education at the College of Teacher Education, Phranakhon Rajabhat University. Participants were required to be directly involved in inclusive educational settings, willing to participate in the coaching activities, and able to complete the entire intervention process.

The implementation group combined mentor teachers and pre-service teachers because the model was designed for the practicum relationship in which school-based mentors support pre-service teachers through modelling, observation, feedback, and reflection. Including both roles enabled the coaching process to be examined within the professional context for which it was developed rather than as an isolated training activity.

In Phase 4 (D2), the five experts and participants involved in the implementation phase contributed to the evaluation of the model in terms of appropriateness, feasibility, effectiveness, satisfaction, strengths, limitations, and recommendations for further improvement.

3.3 Research and Development Procedures

3.3.1 Phase 1: Analysis (R1)

The first phase aimed to investigate the existing problems, developmental needs, and contextual conditions associated with inclusive special education management. The researchers first conducted a documentary review of relevant concepts, theories, and previous studies concerning inclusive education, teacher competency, educational coaching, and creative thinking. The review was used to establish the preliminary conceptual framework and provide a foundation for the development of research instruments and the coaching model.

Empirical information was subsequently collected from school contexts through multiple sources. These included observations of inclusive learning environments, preliminary investigation of instructional

practices, analysis of relevant educational documents such as Individualized Education Programs (IEPs), and semi-structured in-depth interviews with mentor teachers and pre-service teachers.

The interviews focused on four major areas: challenges and barriers in inclusive education, professional competency development needs, experiences with instructional approaches for learners with diverse needs, and participants' perspectives on coaching-oriented professional development.

Qualitative data from documentary analysis, observations, and interviews were analysed using content analysis. The analysis involved data organisation, coding, categorisation, synthesis, and interpretation. The findings from this phase were used to identify major areas requiring development and to establish practical directions for the proposed coaching model.

3.3.2 Phase 2: Development (D1)

The second phase focused on constructing and validating the coaching model. Findings from Phase 1 were synthesised with theoretical perspectives on educational coaching, inclusive special education, teacher competency development, and creative thinking.

The initial coaching model was developed to include its principles, objectives, developmental content, coaching process, learning activities, roles of the coach and participants, and evaluation procedures. The model was also conceptualised systematically in terms of Input, Process, Output, and Feedback to ensure consistency between its theoretical components and practical implementation.

The coaching process incorporated activities such as collaborative problem analysis, developmental goal setting, case analysis, inclusive lesson planning, instructional practice, classroom observation, constructive feedback, individual and group reflection, and revision of instructional plans. The coach functioned primarily as a facilitator, consultant, reflective partner, and professional learning supporter. Mentor teachers and pre-service teachers participated actively in analysing instructional challenges, planning solutions, implementing learning activities, reflecting on their experiences, and continuously refining their practice. These roles and processes were intended to transform coaching from a one-way advisory process into collaborative professional learning.

A training package and model implementation manual were developed concurrently. The materials covered key aspects of inclusive special education management, coaching principles, inclusive instructional design, educational media and technology, assessment practices, and creative thinking development.

The preliminary coaching model, training package, implementation manual, and related research instruments were then submitted to five experts for evaluation. The experts examined the appropriateness of the principles and objectives, consistency among model components, clarity of the coaching procedures, accuracy of the content, suitability of the activities, feasibility of implementation, and content validity of the research instruments. Suggestions from the experts were incorporated into the revision of the model before implementation.

3.3.3 Phase 3: Implementation (R2)

Following expert validation, the revised coaching model was implemented with the selected group of 30 mentor teachers and pre-service teachers in authentic inclusive educational contexts.

Before implementation, participants were informed of the objectives, procedures, roles, and expectations associated with the coaching process. They then participated in a sequence of activities designed to strengthen their knowledge and practical competencies in inclusive special education while simultaneously promoting creative thinking.

Implementation followed the same five-stage sequence for all participants: Understanding, Analysis, Planning, Coaching & Practice, and Reflection. Each stage was linked to the next through evidence from

participants' instructional planning, classroom practice, observation, feedback, and reflective records. This structured sequence was used to improve consistency of implementation while still allowing instructional adaptations to learner needs and school context.

The implementation process included analysis of inclusive instructional problems, establishment of professional development goals, inclusive lesson planning, instructional practice, classroom observation, feedback, reflective dialogue, and collaborative problem solving. Participants were encouraged to apply new knowledge in authentic teaching situations, generate alternative instructional approaches, evaluate the outcomes of their decisions, and revise their practices accordingly.

Throughout the implementation, the researchers and coaches acted as facilitators of professional learning rather than direct instructors. Continuous consultation, questioning, feedback, and reflection were used to encourage participants to analyse their experiences and construct contextually appropriate solutions. Participants' development was monitored before, during, and after implementation to obtain comprehensive evidence concerning changes in inclusive education competencies and creative thinking skills.

Pretest and posttest assessments were administered to examine changes in participants' inclusive special education management competencies and creative thinking skills. Qualitative evidence was also collected through observations, reflective records, participants' work products, and field notes in order to provide complementary explanations of the developmental process.

A single-group pretest-posttest design was used at this developmental stage because the primary objective was to examine whether the newly developed model was feasible and whether participants showed measurable change after completing the intervention. No comparison group was included; therefore, the observed pretest-posttest differences should be interpreted as evidence of change associated with participation in the coaching programme, not as definitive proof that the coaching model alone caused the improvements.

Practice-Based Instructional Media Used During the Coaching Activities

As part of the Coaching & Practice stage, participants were encouraged to design, adapt, and apply inclusive instructional media in response to learner characteristics identified during the Analysis and Planning stages. The media were treated as practice-based instructional products through which participants could demonstrate flexible learning design, appropriate use of educational technology, and creative adaptation for learners with diverse needs. Two illustrative products were a Thai reading screening board game and an inclusive mathematics game.

The Thai reading screening board game combined word- and syllable-based play, dice movement, and a QR-linked online screening component (QRThaiScreening). It was designed to support initial observation and screening of reading ability through an engaging game format. The inclusive mathematics game (QRMaths) used a number wheel, dice, and number cards to provide accessible practice with basic numerical concepts and calculation. Its visual, game-based format was intended to allow flexible participation, including for learners requiring additional support. These media were incorporated as examples of differentiated activities and technology-supported learning rather than as separate outcome measures.



Figure 1. Examples of inclusive instructional media developed/applied during the Coaching & Practice stage: Thai reading screening board game (left) and QRMaths inclusive mathematics game (right).

3.3.4 Phase 4: Evaluation and Refinement (D2)

The final phase evaluated the overall effectiveness and practical applicability of the developed coaching model. Evaluation covered both learning outcomes and implementation processes.

Pretest and posttest results were compared to determine changes in participants' inclusive special education management competencies and creative thinking skills. Participants also evaluated the model in terms of its appropriateness, usefulness, feasibility, clarity of activities, supporting materials, coaching processes, and overall satisfaction.

In addition, qualitative feedback was collected through open-ended responses, reflective records, observations, and focus-group discussions. Participants and experts were encouraged to identify strengths of the model, limitations encountered during implementation, and conditions necessary for successful application in educational settings.

Quantitative and qualitative findings were subsequently integrated to inform final revisions to the model. Adjustments were made to relevant components, procedures, activities, implementation guidelines, and supporting materials, resulting in the final version of the coaching model for inclusive special education management and creative thinking development.

3.4 Research Instruments

Five principal research instruments were developed and employed in accordance with the objectives and phases of the study.

3.4.1 Semi-Structured In-Depth Interview

A semi-structured interview protocol containing 12 questions was developed for Phase 1 to investigate problems, barriers, developmental needs, and contextual conditions associated with inclusive special education management. The interview consisted of three major sections: participants' general information, problems and barriers related to inclusive educational practice, and professional development needs.

Content validity was examined by five experts using the Index of Item-Objective Congruence (IOC). Item-level IOC values ranged from 0.80 to 1.00, with an overall mean IOC of 0.94, indicating satisfactory content validity.

3.4.2 Questionnaire

A 30-item questionnaire using a five-point Likert scale was developed to examine participants' perceptions of and satisfaction with the coaching model. The questionnaire addressed participant information, perceptions of the model, and satisfaction with its implementation.

The instrument was reviewed by five experts and subsequently pilot-tested with 30 individuals whose characteristics were similar to those of the research participants. Item-level IOC values ranged from 0.80 to 1.00, with a mean IOC of 0.96. Internal consistency reliability, calculated using Cronbach's alpha, was 0.95.

3.4.3 Inclusive Special Education Management Competency Assessment

A 35-item, five-point rating scale was developed to assess participants' competencies in inclusive special education management. The instrument comprised five dimensions:

1. learner analysis;
2. learning design;
3. organisation of learning activities;
4. use of educational media and technology; and
5. measurement and assessment.

These dimensions reflected the professional competencies required for responding to learner diversity and implementing inclusive educational practice.

The instrument was evaluated by five experts, producing IOC values ranging from 0.80 to 1.00, with a mean IOC of 0.97. A pilot test with 30 participants of similar characteristics yielded an overall Cronbach's alpha coefficient of 0.96.

3.4.4 Creative Thinking Skills Assessment

Creative thinking skills were assessed using a 24-item, five-point rating scale developed with reference to Torrance's (1974) conceptualisation of creativity. Four dimensions were assessed:

1. Fluency;
2. Flexibility;
3. Originality; and
4. Elaboration.

The items were adapted to the context of inclusive instructional design and teacher professional practice. Expert evaluation produced IOC values ranging from 0.80 to 1.00, with a mean IOC of 0.95. The instrument was pilot-tested with 30 participants with similar characteristics, resulting in an overall Cronbach's alpha coefficient of 0.94.

3.4.5 Focus Group Protocol

A semi-structured focus-group protocol was employed during Phase 4 to obtain qualitative feedback regarding the effectiveness and practical application of the coaching model. Discussion focused on four areas: appropriateness of the model, strengths, limitations in implementation, and recommendations for further development.

The focus-group protocol was reviewed by five experts for content validity. IOC values ranged from 0.80 to 1.00, with a mean IOC of 0.96.

Overall, all research instruments satisfied the established content-validity criteria, while the quantitative instruments demonstrated high internal consistency, with Cronbach's alpha coefficients ranging from 0.94 to 0.96.

3.5 Data Collection

Data collection was conducted sequentially in accordance with the four phases of the research design.

During Phase 1, documentary evidence, observations, and semi-structured interviews were used to establish an empirical understanding of existing inclusive educational practices, problems, and professional development needs.

During Phase 2, data were collected from five experts who evaluated the preliminary coaching model, training materials, implementation manual, and research instruments. Their quantitative ratings and qualitative recommendations were used to refine the model prior to implementation.

During Phase 3, baseline data were collected before implementation using the inclusive special education management competency assessment and creative thinking skills assessment. The coaching model was subsequently implemented with the participating mentor teachers and pre-service teachers. Throughout implementation, additional qualitative data were obtained from observations, reflective records, field notes, and participants' instructional products. Post-intervention assessments were then administered using the same competency and creative thinking measures.

During Phase 4, participants evaluated their satisfaction with the coaching model, while additional qualitative data were gathered through open-ended responses and focus-group discussions. These sources provided evidence concerning the model's strengths, limitations, feasibility, and potential for application in authentic educational contexts.

The use of multiple data sources allowed for triangulation between quantitative evidence of change and qualitative evidence concerning participants' professional learning experiences.

3.6 Data Analysis

Both quantitative and qualitative analyses were undertaken in accordance with the mixed-methods design.

Quantitative data were initially analysed using frequency and percentage to describe participant characteristics. Mean and standard deviation were used to analyse participants' levels of inclusive special education management competency, creative thinking skills, perceptions of model appropriateness, and satisfaction with the coaching model. These descriptive statistics were consistent with the five-point rating scales used in the study.

To determine the effectiveness of the coaching model, participants' pretest and posttest scores for inclusive special education management competency and creative thinking skills were compared using a paired-samples t-test. Statistical significance was established at the .05 level.

Qualitative data obtained from interviews, observations, reflective records, field notes, open-ended responses, and focus-group discussions were analysed using content analysis. The analytical process involved organising the data, coding meaningful units, grouping related codes into categories, identifying emerging themes, synthesising evidence across data sources, and interpreting the findings in relation to the research objectives. The original research design also specified content analysis and descriptive synthesis for explaining problems, needs, developmental processes, and outcomes associated with implementation of the model.

Finally, quantitative and qualitative findings were integrated during interpretation. Quantitative evidence was used to determine the magnitude and statistical significance of changes in competency and creative thinking, while qualitative evidence was used to explain how participants experienced the coaching process, how professional practices changed, and which characteristics of the model contributed to or constrained its implementation. This integration provided a comprehensive basis for evaluating and refining the final coaching model.

4. Results

The findings are presented according to the four phases of the Research and Development process: Analysis (R1), Development (D1), Implementation (R2), and Evaluation (D2).

4.1 Problems and Developmental Needs in Inclusive Special Education Management

The analysis revealed that mentor teachers and pre-service teachers experienced several limitations in implementing inclusive special education. Major problems concerned insufficient knowledge and understanding of inclusive education principles, particularly the development of Individualized Education Programs (IEPs) and the application of Universal Design for Learning (UDL). Participants also reported difficulties in designing flexible learning activities, selecting appropriate media and technologies, adapting instruction to individual learner differences, and conducting assessment that reflected the actual potential of learners with special educational needs.

In addition, participants had limited opportunities to apply inclusive education principles in authentic classroom contexts. Pre-service teachers in particular reported uncertainty when translating theoretical knowledge into practice, while mentor teachers lacked a systematic process for supporting and supervising inclusive instructional practice. Consequently, participants expressed a strong need for professional development that emphasised practice-based learning, reflective practice, continuous feedback, and ongoing professional support rather than conventional lecture-based training.

These findings provided the empirical foundation for the development of the coaching model.

4.2 Development and Expert Evaluation of the Coaching Model

Based on the needs analysis and synthesis of relevant theories, a process-based coaching model was developed to enhance inclusive special education management competencies and creative thinking skills. The model integrated inclusive education, educational coaching, experiential learning, reflective practice, continuous feedback, creative thinking, and collaborative learning.

The developed model consisted of four major components: (1) principles, (2) objectives, (3) a five-step coaching process, and (4) evaluation. The coaching process was organised as a continuous cycle consisting of:

1. Understanding – developing foundational knowledge of inclusive education, coaching, and creative thinking;
2. Analysis – identifying learner characteristics, instructional problems, and professional development needs;
3. Planning – designing flexible and inclusive learning plans, media, technology, and assessment approaches;
4. Coaching & Practice – implementing instructional plans in authentic contexts with observation, coaching, and feedback; and
5. Reflection – analysing outcomes, identifying strengths and areas for improvement, and linking reflection to the next cycle of development.

The five stages were designed as a continuous coaching cycle integrating practice, feedback, and reflective learning.

The developed model consisted of four major components: (1) principles, (2) objectives, (3) a five-step coaching process, and (4) evaluation. The coaching process was organised as a continuous cycle consisting of: (1) Understanding—developing foundational knowledge of inclusive education, coaching, and creative thinking; (2) Analysis—identifying learner characteristics, instructional problems, and professional development needs; (3) Planning—designing flexible and inclusive learning plans, media, technology, and assessment approaches; (4) Coaching & Practice—implementing instructional plans in authentic contexts with observation, coaching, and feedback; and (5) Reflection—analysing outcomes, identifying strengths and areas for improvement, and linking reflection to the next cycle of development. The five stages were designed as a continuous coaching cycle integrating practice, feedback, and reflective learning.



Figure 2. Conceptual structure and five-step coaching process of the developed model.

Expert evaluation indicated that the overall appropriateness of the coaching model was at the highest level (M = 4.61, SD = 0.52). Among the four components, the coaching process received the highest evaluation (M = 4.70), followed by the principles of the model (M = 4.67), objectives (M = 4.60), and evaluation procedures (M = 4.47).

4.3 Effectiveness of the Coaching Model

4.3.1 Inclusive Special Education Management Competencies

Participants demonstrated substantial improvement in inclusive special education management competency following implementation of the coaching model. The overall mean score increased from M = 2.83 (SD = 0.43) before implementation to M = 4.32 (SD = 0.37) after implementation. A paired-samples t-test indicated that the difference was statistically significant, $t = 15.62$, $p < .05$.

Table 1. Pretest and posttest inclusive special education management competency scores

Measure	*Pretest M (SD)*	*Posttest M (SD)*	*t*	*p*
Overall competency	2.83 (0.43)	4.32 (0.37)	15.62	< .05

All five competency dimensions showed significant improvement. The highest post-intervention mean was found for organisation of learning activities (M = 4.38), followed by learning design (M = 4.35). Improvements were also evident in learner analysis, use of media and technology, and measurement and assessment.

These findings indicate that the coaching model enhanced participants' competencies across all major dimensions of inclusive special education management.

4.3.2 Creative Thinking Skills

Creative thinking skills also increased significantly following implementation of the coaching model. The overall mean increased from M = 2.85 (SD = 0.46) before implementation to M = 4.31 (SD = 0.37) after implementation, with a statistically significant difference, t = 15.07, p < .05.

Table 2. Pretest and posttest creative thinking skills scores

Measure	*Pretest M (SD)*	*Posttest M (SD)*	*t*	*p*
Overall creative thinking	2.85 (0.46)	4.31 (0.37)	15.07	< .05

All four dimensions of creative thinking improved significantly. Originality recorded the highest post-intervention mean (M = 4.34), followed by Fluency (M = 4.31), Flexibility (M = 4.29), and Elaboration (M = 4.28).

These results suggest that the coaching process supported not only professional competency development but also participants' ability to generate, adapt, and elaborate alternative instructional approaches.

4.4 Qualitative Findings on Professional Practice

Qualitative evidence from observations, reflective records, interviews, and focus-group discussions supported the quantitative findings. Three major themes emerged.

First, participants reported that the coaching model helped them develop a more systematic approach to instructional planning and implementation. They became more capable of linking learner analysis, instructional design, learning activities, and assessment into a coherent process.

Second, coaching promoted deeper professional learning through questioning, feedback, and reflection. Participants indicated that the coaching process encouraged them to analyse their own practice rather than simply follow prescribed teaching procedures. This led to improved understanding, greater awareness of instructional strengths and limitations, and more flexible responses to learner diversity.

Third, participants were able to transfer the model into authentic classroom practice. Observational data showed increased use of differentiated activities, group work, educational games, simulations, and diverse media and technologies. Participants also adapted instructional explanations, classroom environments, learning time, and levels of support according to individual learner needs. These changes were accompanied by increased confidence in inclusive teaching and greater willingness to experiment with new instructional approaches.

Examples of this transfer included participant-designed or adapted game-based media such as the Thai reading screening board game with QR-linked screening and the QRMaths number-wheel activity (Figure 1). These products illustrated how participants translated learner analysis into differentiated, visually accessible, and technology-supported instructional activities. They also provided concrete evidence of creative professional practice through the generation and elaboration of alternative learning approaches.

4.5 Participant Satisfaction and Final Model Refinement

The final evaluation demonstrated a high level of acceptance and practical feasibility. Participants reported an overall satisfaction score of M = 4.71 (SD = 0.46), representing the highest level of satisfaction. The highest-rated dimension concerned the coach/facilitator (M = 4.77), followed by practical application (M = 4.70), while content and the coaching process both received similarly high ratings (M = 4.69).

Table 3. Expert evaluation and participant satisfaction with the coaching model

Evaluation	*M*	*SD*	*Interpretation*
Expert evaluation of model appropriateness	4.61	0.52	Highest
Participant satisfaction	4.71	0.46	Highest

Qualitative evaluation further indicated that participants regarded the model as clear, systematic, supportive of deep learning, and applicable to authentic inclusive classrooms. The final model was therefore refined in four major areas: additional examples of inclusive learning activities, clearer implementation guidelines, improved supporting assessment and reflection tools, and greater flexibility in implementation according to school context and teacher workload.

The refinement process resulted in a more practical model that could be implemented through both on-site and online coaching, while retaining the five-stage coaching cycle. The final model therefore combined systematic structure with sufficient flexibility for adaptation across different educational settings.

Overall, the findings demonstrate that the developed coaching model was appropriate, effective, and practically applicable. It significantly enhanced both inclusive special education management competencies and creative thinking skills, while also supporting reflective practice, professional confidence, and continuous improvement among mentor teachers and pre-service teachers.

5. Discussion

5.1 Theoretical and Practical Contributions

The findings indicate that the developed coaching model effectively enhanced both inclusive special education management competencies and creative thinking skills among mentor teachers and pre-service teachers. One important explanation for this result is that the model addressed the gap between theoretical knowledge and authentic classroom practice. Although participants possessed some prior understanding of inclusive education, the initial needs analysis showed that they experienced difficulties applying such knowledge to learner analysis, instructional adaptation, differentiated learning activities, appropriate media and technology use, and flexible assessment. This finding reflects a persistent challenge in inclusive education, where knowledge of principles alone may not be sufficient to support diverse learners unless teachers are able to translate those principles into context-responsive classroom practice.

The effectiveness of the model can also be explained by its practice-based and reflective orientation. Rather than relying primarily on conventional training or knowledge transmission, the coaching process involved analysis of authentic instructional problems, planning, classroom practice, feedback, and reflection. This is consistent with Knight's (2018) view that effective instructional coaching should be continuous, structured, collaborative, and closely connected to actual teaching practice. The model therefore enabled participants to test ideas in real educational settings, receive feedback, examine learner responses, and continuously improve their instructional decisions.

Another important finding was the improvement in participants' creative thinking skills. The coaching process encouraged participants to generate alternative approaches, modify learning activities, experiment with different instructional media, and respond flexibly to individual learner differences. These findings suggest that creativity in inclusive teaching is not an isolated cognitive skill but an important component of adaptive professional practice. This is consistent with the OECD (2019) emphasis on creativity and problem solving as essential competencies for twenty-first-century learning and professional practice.

Reflective practice also appeared to be a central mechanism underlying the effectiveness of the model. Participants became more capable of identifying strengths and weaknesses in their own teaching, linking instructional decisions with learner responses, and planning subsequent improvement. The findings are consistent with Kolb's (1984) experiential learning perspective, in which meaningful professional learning emerges through the interaction of concrete experience, reflection, conceptualisation, and subsequent action. In the present study, coaching and reflection transformed classroom experience into a continuous cycle of professional learning.

Qualitative findings further demonstrated that the model influenced actual teaching behaviour rather than merely increasing participants' knowledge. Participants reported greater confidence in inclusive teaching, increased use of flexible and differentiated activities, greater willingness to experiment with new instructional approaches, and improved ability to reflect systematically on their own practice. The combination of quantitative improvement and observable changes in teaching practice strengthens the evidence that the coaching model functioned as a mechanism for professional development rather than simply as a short-term training intervention.

Overall, the findings suggest that the developed coaching model was effective because it integrated practice-based learning, continuous coaching, reflective practice, collaborative learning, and creative problem solving within a single professional development process. These elements enabled mentor teachers and pre-service teachers to connect theoretical knowledge with authentic inclusive classroom practice while continuously adapting their professional decisions to learner diversity.

5.2 Limitations

The study was conducted within a specific group of mentor teachers and pre-service teachers and therefore the generalisability of the findings should be considered with caution. In addition, the intervention focused on relatively short-term outcomes; the study did not establish whether improvements in competency and creative thinking were sustained over extended periods.

A further limitation is the absence of a comparison or control group. Because the effectiveness evaluation used a single-group pretest-posttest design, alternative explanations such as maturation, concurrent professional experiences, repeated testing, or other contextual influences cannot be fully ruled out. Accordingly, the statistically significant improvements demonstrate within-group change over the intervention period but should not be interpreted as conclusive causal effects attributable solely to the coaching model. Future studies should employ comparison-group, quasi-experimental, or experimental designs where feasible to strengthen causal inference.

5.3 Implications for Practice and Future Research

The developed coaching model may be applied as a professional development framework in schools implementing inclusive education. In particular, mentor teachers can be prepared to function as coaches who provide sustained professional support to pre-service teachers through observation, questioning, feedback, and reflective dialogue.

The model may also be integrated into teacher practicum and professional experience programmes in teacher education institutions. This would enable pre-service teachers to develop inclusive teaching competencies through direct application rather than relying exclusively on university-based theoretical preparation. The source chapter specifically recommends integrating coaching into teacher preparation and developing mentor teachers as school-based coaches.

Because school contexts differ in available time, workload, resources, and professional support, the model should be implemented flexibly. The study suggests that blended or online coaching may be used alongside face-to-face coaching where appropriate.

Future research should therefore investigate the long-term effects of the coaching model through follow-up studies conducted six months or one year after implementation. Further studies should also include more diverse groups of teachers, educational levels, and school contexts, including rural and secondary education settings.

Future development could additionally examine the integration of online coaching and blended coaching, as well as other factors that may influence professional development outcomes, such as motivation, instructional leadership, school culture, and organisational support.

6. Conclusion

This study developed and evaluated a coaching model designed to enhance inclusive special education management competencies and promote creative thinking skills among mentor teachers and pre-service teachers in schools within the service areas of Phranakhon Rajabhat University.

The study demonstrated that participants required professional development particularly in learner analysis, inclusive instructional design, flexible learning activities, educational media and technology, and assessment. They also expressed a strong preference for development approaches involving authentic practice, reflection, collaborative learning, and continuous professional support.

In response to these needs, a process-based coaching model was developed integrating principles, objectives, coaching activities, reflective practice, and evaluation. The model enabled participants to engage in a continuous cycle of professional learning and was found to be appropriate and applicable to inclusive educational contexts.

Implementation of the model resulted in improvements across all major dimensions of inclusive special education management competency, as well as in fluency, flexibility, originality, and elaboration in creative thinking. Participants also demonstrated greater confidence, more flexible instructional design, and stronger capacity to adapt learning experiences to learner diversity.

The findings therefore support the use of coaching as a systematic mechanism for connecting teacher preparation, school-based professional development, inclusive education, and creative professional practice.

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RESEARCH ARTICLE

Crisis Leadership in the Aftermath of Healthcare Cyberattacks: Digital Forensics, Organizational Learning, and Patient Safety

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ABSTRACT

Healthcare cyberattacks threaten not only digital infrastructure but also organizational continuity and patient safety. Although existing research has examined crisis leadership, digital forensics, organizational learning, and cyber resilience, these areas are often treated separately. This conceptual paper integrates these perspectives to explain how healthcare organizations can convert cyber incidents into opportunities for learning and resilience development. Drawing on literature from crisis leadership, cybersecurity, digital forensics, organizational learning, healthcare resilience, and patient safety, the paper develops a conceptual framework linking crisis leadership, digital forensic effectiveness, organizational learning, cyber resilience, and patient safety. Five propositions are advanced. The framework argues that effective crisis leadership supports digital forensic investigation, that forensic investigation strengthens organizational learning, and that leadership enhances the translation of forensic findings into organizational change. Organizational learning is subsequently proposed to strengthen cyber resilience, while greater resilience reduces cyber-related risks to patient safety. The paper contributes by repositioning digital forensics as a source of organizational knowledge, extending crisis leadership into the post-cyberattack healthcare context, and linking cyber resilience directly with patient safety. The framework provides a basis for future empirical testing and offers practical guidance for healthcare leaders seeking to improve post-incident learning, recovery, and organizational preparedness.

Keywords: *Crisis Leadership, Healthcare Cyberattacks, Digital Forensics, Organizational Learning, Cyber Resilience, Patient Safety*

1. Introduction and Background

Healthcare delivery is becoming more dependent on interconnected digital infrastructures, including electronic health records, laboratory information systems, diagnostic platforms, medication-management systems, and networked medical devices. This dependence has improved the speed and coordination of care, but it has also increased the consequences of cybersecurity incidents. Ransomware and related attacks can restrict access to clinical information, interrupt diagnostic and treatment workflows, divert patients, and place additional pressure on neighboring facilities. Empirical studies have shown that hospital ransomware incidents can disrupt emergency care, reduce patient volumes at affected hospitals, increase demand at nearby hospitals, and create substantial difficulties for healthcare professionals during recovery (Abouk & Powell, 2024; van Boven et al., 2024). Cybersecurity in

healthcare should therefore be understood not only as an information technology concern but also as an organizational and patient-safety problem.

The response to healthcare cyberattacks extends beyond technical containment. Leaders must make decisions under uncertainty, establish priorities for service continuity, coordinate clinical and technical teams, communicate with internal and external stakeholders, and guide the organization through recovery. Research on healthcare crisis management shows that effective crisis leadership involves both task-oriented and person-oriented behaviors and that leadership and management practices can support organizational resilience and performance during disruptive events (Atkinson et al., 2024; Yang et al., 2024). These responsibilities become particularly important in cyber crises because leaders must balance the restoration of digital systems with the immediate need to maintain safe clinical services.

Digital forensics provides an important link between incident response and organizational recovery. Post-incident investigation can establish what occurred, identify affected systems, determine contributing causes, preserve reliable evidence, and support corrective action. Contemporary cybersecurity guidance increasingly embeds investigation within broader incident-response and recovery processes. The National Institute of Standards and Technology (NIST) Cybersecurity Framework 2.0 emphasizes governance, response, and recovery, while NIST SP 800-61 Rev. 3 integrates incident response throughout organizational cybersecurity risk management and emphasizes effective detection, response, and recovery (Nelson et al., 2025; Pascoe et al., 2024). In healthcare, however, the value of digital forensics should not end with technical remediation or attribution. Evidence generated during an investigation can also provide an important basis for organizational learning.

Organizational learning is critical because recovery without learning may leave the underlying conditions that enabled an incident unchanged. Patterson et al. (2023) found that organizations often struggle to convert cybersecurity incidents into sustained learning. Common weaknesses include superficial causal investigations, limited participation in learning activities, poor implementation of lessons, and insufficient evaluation of whether corrective actions reduce subsequent risk. For healthcare organizations, these limitations have wider implications because recurrent cyber vulnerabilities can threaten service continuity, information integrity, and ultimately patient safety.

Despite growing research on healthcare cyberattacks, crisis leadership, incident response, and organizational learning, these streams remain insufficiently integrated. Existing studies commonly examine the operational consequences of cyberattacks, technical incident-response processes, or leadership during healthcare crises separately. Less attention has been given to how crisis leadership shapes the use of digital forensic evidence, how forensic findings are converted into organizational learning, and how such learning contributes to safer and more resilient healthcare delivery. The increasing recognition that cyber incidents can produce clinical and system-wide disruption strengthens the need for such an integrated perspective (Abouk & Powell, 2024; van Boven et al., 2024).

This paper addresses this gap by developing a conceptual framework linking *crisis leadership, digital forensic investigation, organizational learning, and patient safety* in the aftermath of healthcare cyberattacks. It argues that crisis leaders influence not only immediate response and recovery but also whether forensic knowledge is translated into structural, behavioral, and procedural change. By connecting leadership theory with cybersecurity incident investigation and healthcare safety, the paper seeks to explain how healthcare organizations can move beyond simply restoring disrupted systems towards learning from cyber incidents in ways that strengthen organizational resilience and protect patients.

2. Literature Review and Proposition Development

2.1 Crisis Leadership in Healthcare Organizations

Crisis leadership refers to the actions through which leaders prepare for, respond to, and learn from events that threaten organizational functioning. Crises differ from routine managerial problems because they combine urgency, uncertainty, resource pressure, and potentially severe consequences (Riggio & Newstead, 2023; Wu et al., 2021). In such settings, leaders must provide direction while coordinating multiple professional groups and adjusting decisions as new information becomes available. Recent work emphasizes that crisis leadership is not limited to the attributes of a single senior executive. It is also collective, contextual, and dynamic, requiring coordinated leadership across organizational levels (Nesse et al., 2024). In healthcare, this complexity is intensified because leadership decisions can directly affect continuity of care and patient outcomes.

Evidence from healthcare settings indicates that both task-oriented and person-oriented leadership behaviors are important during disruption. Yang et al. (2024) found that crisis leadership behaviors were positively associated with staff performance evaluation and commitment to sustaining change. Atkinson et al. (2024) similarly identified leadership and management practices that support resilience and organizational performance during crises. Communication, coordination, role clarity, psychological safety, and learning are therefore mechanisms through which organizations maintain functioning under pressure.

Cyberattacks create a particular leadership challenge because clinical, technical, legal, communication, and operational decisions must often be made simultaneously. Leaders must establish service priorities, coordinate cybersecurity and clinical teams, authorize contingency measures, and support recovery without compromising an investigation. Crisis leadership is therefore expected to influence the conditions under which digital forensic investigation can be conducted effectively. We therefore make the following proposition:

> **Proposition 1:** *Effective crisis leadership positively influences the effectiveness of digital forensic investigation after healthcare cyberattacks.*

2.2 Healthcare Cyberattacks as Organizational Crises

Healthcare cyberattacks should not be treated solely as information technology failures. Digital systems are embedded in clinical work, medication management, diagnostics, scheduling, communication, and access to patient records. Ewoh & Vartiainen (2024) describe healthcare cybersecurity as a sociotechnical problem involving technology, people, and organizational processes. This perspective is important because disruption to one digital component can propagate across clinical and administrative functions. Empirical evidence shows that ransomware attacks can alter healthcare delivery beyond the compromised network. Van Boven et al. (2024) documented major operational difficulties during hospital ransomware incidents. Abouk & Powell (2024) found decreases in emergency department visits and inpatient admissions in attacked hospitals, alongside temporary increases in emergency department activity at nearby hospitals. Cyberattacks therefore display the characteristics of organizational crises because they generate uncertainty, time pressure, disrupted routines, and potential harm.

Recognizing cyberattacks as organizational crises expands responsibility beyond technical specialists. Senior and clinical leaders become responsible for continuity of care, escalation, communication, resource allocation, and restoration priorities. The quality of these decisions may shape both the effectiveness of the investigation and the organization's capacity to learn from the event.

2.3 Digital Forensics and Post-Incident Investigation

Digital forensics provides the processes through which digital evidence is identified, preserved, examined, and interpreted following an incident. In healthcare, forensic investigation can help reconstruct attack pathways, establish affected systems and data, identify weaknesses in controls, and support legal, regulatory, and organizational responses. Forensic readiness is especially important because evidence may be lost if appropriate logging, preservation, access controls, and procedures are not established before an incident. Chernyshev et al. (2019) argued that healthcare investigations can be constrained by insufficient forensic readiness, while Elyas et al. (2015) showed that readiness depends on coordinated organizational, procedural, and technical capabilities.

Current cybersecurity guidance also situates investigation within wider risk management. NIST SP 800-61 Revision 3 emphasizes that incident response should be integrated across cybersecurity risk-management activities and not treated as an isolated technical function (Nelson et al., 2025). This approach supports the argument that forensic findings have value beyond attribution. They can expose weaknesses in processes, decision structures, technology, training, and organizational controls.

However, forensic evidence does not automatically produce organizational improvement. Technical findings must be interpreted, communicated, and translated into decisions. Leadership therefore becomes important at the boundary between investigation and organizational action.

2.4 Organizational Learning from Cybersecurity Incidents

Organizational learning refers to processes through which experience is converted into knowledge and embedded in organizational practices. Crossan et al. (1999) conceptualized learning as a multilevel process involving intuiting, interpreting, integrating, and institutionalizing. This is relevant after cyber incidents because lessons initially identified by investigators or individual staff must become shared practices, procedures, and capabilities if the organization is to change.

Research suggests that this transition is often incomplete. Patterson et al. (2023), in a systematic review of learning from cybersecurity incidents, found weaknesses in participation, causal analysis, implementation of lessons, and evaluation of whether corrective actions reduce future incidents. Their subsequent qualitative study found that defensiveness, superficial reviews, and failure to address systemic causes can obstruct effective learning (Patterson et al., 2024). The existence of forensic evidence is therefore insufficient. Organizations require structures and leadership practices that enable evidence to be discussed and converted into corrective action.

Digital forensic investigation can strengthen organizational learning by supplying evidence about what occurred, how controls failed, and where organizational assumptions were inaccurate. More complete evidence should improve post-incident analysis and reduce dependence on speculation. We therefore make the following proposition:

> **Proposition 2:** *Effective digital forensic investigation positively influences organizational learning following healthcare cyberattacks.*

Leadership is also likely to influence this relationship. Leaders determine who participates in post-incident review, whether difficult findings are acknowledged, whether blame suppresses disclosure, and whether resources are committed to implementing lessons. We therefore make the following proposition:

> **Proposition 3:** *The positive relationship between digital forensic investigation and organizational learning is stronger when crisis leadership is effective.*

2.5 Organizational Learning and Cyber Resilience

Organizational resilience refers broadly to the capacity to prepare for, absorb, adapt to, recover from, and learn from disruption. Healthcare resilience literature shows that resilience is not simply a return to the pre-crisis state. It also involves adaptation and capability development that improve responses to future shocks (Carbonara et al., 2024). Learning is therefore central to resilience because organizations that identify causes but fail to change remain vulnerable to recurrence.

Post-cyberattack learning may strengthen resilience through revised incident-response plans, improved technical controls, better forensic readiness, clearer leadership responsibilities, staff training, stronger backup arrangements, and improved communication protocols. Patterson et al. (2023, 2024) similarly emphasize the need to address underlying causes and evaluate whether corrective actions improve future security. We therefore make the following proposition:

> **Proposition 4:** *Organizational learning following healthcare cyberattacks positively influences organizational cyber resilience.*

2.6 Cyber Resilience and Patient Safety

Patient safety provides the final outcome of the proposed framework. Healthcare cyber resilience matters because failures of digital systems can affect access to records, communication, diagnostics, treatment workflows, and coordination of care. Ewoh & Vartiainen (2024) identify patient safety as a central concern in healthcare cybersecurity, while van Boven et al. (2024) show that ransomware incidents can substantially disrupt acute-care processes. Abouk & Powell (2024) further demonstrate that disruption can extend to nearby hospitals through shifts in patient demand.

A resilient healthcare organization should be better able to preserve essential clinical functions, activate workable contingencies, restore systems safely, and incorporate lessons that reduce the impact of future incidents. Resilience should therefore be viewed not only as a cybersecurity outcome but also as a patient-safety capability. We therefore make the following proposition:

> **Proposition 5:** *Greater organizational cyber resilience positively influences patient safety in healthcare organizations.*

2.7 Integration of the Constructs

The reviewed literature suggests a sequential but interconnected process. Crisis leadership shapes the environment in which digital forensic investigation occurs. Forensic investigation generates evidence that supports explanation and learning. Leadership influences whether that evidence is interpreted and converted into organizational change. Organizational learning strengthens cyber resilience, while resilience improves the capacity to maintain safe care during future disruption. The proposed model in **Figure 1** therefore connects leadership, technical investigation, learning, resilience, and patient safety within a single post-cyberattack process. This integration addresses an important gap because these domains have largely developed in parallel despite their practical interdependence in healthcare organizations.

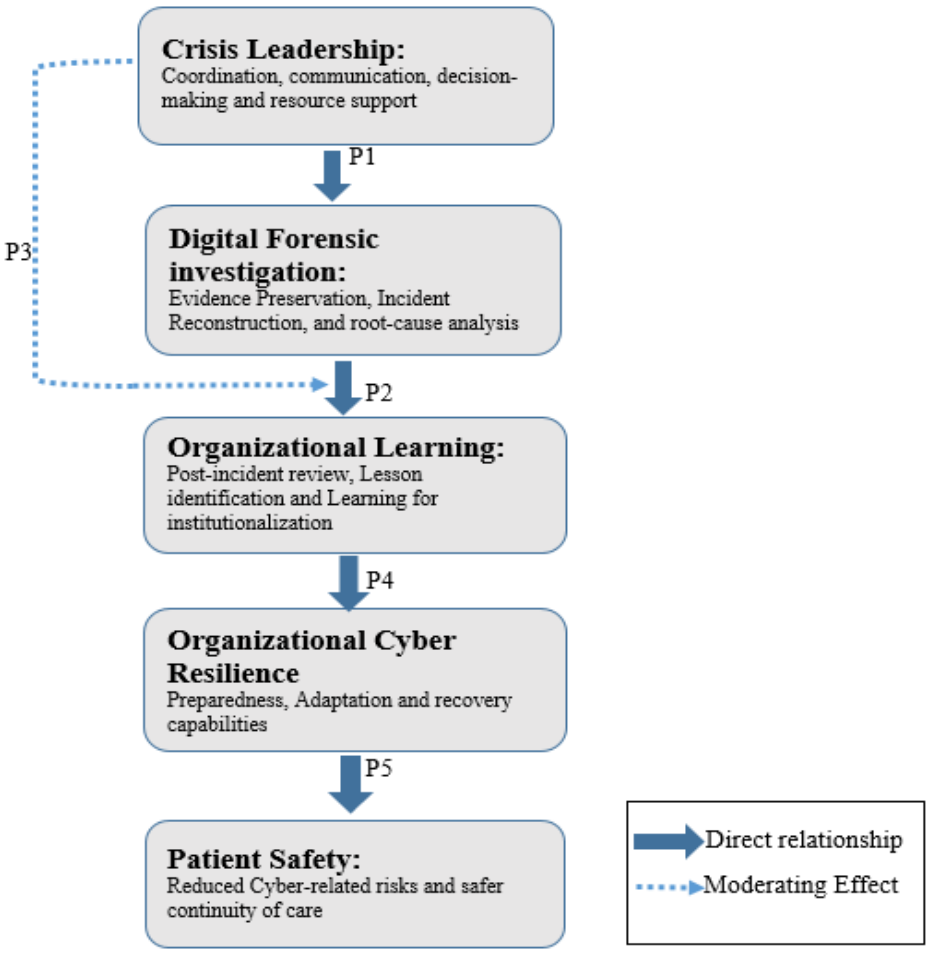

Figure 1: *Conceptual Framework showing the sequential but interconnected process of Crisis Leadership in the Aftermath of Healthcare Cyberattacks.*

3. Methodological Approach

This paper adopts a conceptual research design based on structured integration of literature from several related but largely separate research domains. Conceptual research is appropriate where the objective is to connect existing theoretical perspectives, clarify relationships among constructs, and develop a framework that extends understanding beyond individual disciplinary boundaries (Jaakkola, 2020). The approach used in this study combines theory synthesis with conceptual model development. Rather than testing relationships empirically, the paper integrates existing knowledge to explain how crisis leadership, digital forensic investigation, organizational learning, cyber resilience, and patient safety may interact following healthcare cyberattacks.

The literature synthesis was guided by established approaches to integrative and conceptual reviews (Snyder, 2019; Torraco, 2016). Relevant literature was organized around four principal domains: crisis leadership and healthcare crisis management; cybersecurity incidents and digital forensics; organizational learning and resilience; and patient safety within digitally dependent healthcare environments. Searches focused on combinations of terms including "*crisis leadership*", "*healthcare*",

"cyberattack", "*ransomware"*, "*digital forensics"*, "*forensic readiness"*, "*cybersecurity", "incident learning"*, "*organizational learning"*, "*cyber resilience"* and "*patient safety"*. Because the research problem crosses disciplinary boundaries, literature addressing transferable organizational and cybersecurity theories outside healthcare was also considered where it contributed directly to development of the proposed relationships.

Priority was given to peer-reviewed journal articles and authoritative cybersecurity guidance. Recent publications were emphasized to reflect developments in healthcare cybersecurity and organizational responses to digital disruption. Earlier studies were retained where they provided established theoretical foundations, particularly for organizational learning and digital forensic readiness. Sources concerned exclusively with technical attack execution, without relevance to leadership, investigation, organizational learning, resilience, or healthcare consequences, were not central to the synthesis.

Analysis proceeded through an iterative comparison of constructs, mechanisms, and outcomes across the identified literature. Particular attention was given to recurring relationships between leadership behavior and crisis response, forensic investigation and knowledge generation, organizational learning and capability development, and resilience and continuity of safe healthcare delivery. Areas in which these literatures converged were subsequently used to establish theoretically defensible links among the constructs. Table 1 shows the Key papers that were used in this paper.

Table 1: Key Literature for the Study

Author	Theme	Contribution to this paper
Atkinson et al., 2024	Healthcare crisis leadership and resilience	Supports the role of leadership behaviors and management practices and resilience in crisis situations.
Yang et al., 2024	Crisis leadership behavior in healthcare	Shows that crisis leadership improves staff outcomes and coordinated response during disruption.
Ewoh & Vartiainen, 2024	Healthcare cybersecurity as a sociotechnical issue	Frames cyberattacks as organizational, people, and process problems with patient-safety implications.
Van Boven et al., 2024	Health care impacts of ransomware attacks	Demonstrates operational and clinical disruption caused by hospital ransomware incidents.
Abouk & Powell, 2024	Ransomware and hospital service disruption	Provides evidence that attacks reduce emergency department visits and admissions and shift demand to nearby hospitals.
Chernyshev et al., 2019	Digital forensic readiness in healthcare	Highlights the importance of forensic readiness for post-incident investigation.
Nelson et al., 2025	Incident response and cybersecurity risk management	Grounds digital forensics and incident response within broader cybersecurity risk management.

Author	Theme	Contribution to this paper
Patterson et al., 2023	Organizational learning from cybersecurity incidents	Explains why organizations struggle to learn from cyber incidents and supports the learning-resilience link.
Patterson et al., 2024	Practices and challenges of post-incident learning	Shows barriers to converting incident findings into organizational change and supports the leadership moderation argument.
Carbonara et al., 2024	Hospital resilience resources and capabilities	Supports the link between organizational learning and resilience in healthcare organizations.
Neprash et al., 2026	Effects of ransomware on hospitals and patients	Strengthens the patient-safety rationale by linking attacks to disrupted care and worse patient outcomes.
Crossan et al., 1999	Organizational learning framework	Provides the theoretical basis for turning incident insights into institutionalized learning.

The synthesis moved from identification of these relationships to development of five propositions presented in the preceding literature review. These propositions were then organized into an integrated conceptual framework. Consistent with conceptual model development, the propositions represent theoretically derived relationships that require subsequent empirical examination (Jaakkola, 2020). This methodological approach therefore enables the paper to connect fragmented research streams and provide a coherent explanation of how healthcare organizations may transform evidence generated after cyberattacks into organizational learning, improved cyber resilience, and stronger protection of patient safety.

4. Findings and Discussion: Proposed Conceptual Framework

4.1 Crisis Leadership and Digital Forensic Effectiveness

The conceptual synthesis indicates that crisis leadership should be viewed as an enabling condition for effective digital forensic investigation and not as an activity that begins after technical investigation is complete. Healthcare cyber incidents create simultaneous clinical, operational, technical, legal, and communication demands. Leaders must therefore establish priorities, clarify authority, protect critical services, and create conditions in which investigators can preserve evidence without unnecessarily extending disruption. Research on healthcare crisis leadership shows that coordination, communication, role clarity, and adaptive decision-making are important to organizational performance during crises (Atkinson et al., 2024; Yang et al., 2024). These same behaviors are relevant to cyber incidents because forensic teams depend on timely access to systems, cooperation from staff, reliable escalation channels, and leadership support for evidence preservation.

This relationship also involves an important tension. Pressure to restore systems rapidly may conflict with the need to preserve logs, system images, and other evidence required for investigation. Leadership therefore influences the manner in which recovery is pursued as a purely technical restoration exercise

or as a controlled process that balances continuity of care with investigative integrity. NIST guidance similarly treats incident response as part of wider cybersecurity risk management instead of as an isolated technical activity (Nelson et al., 2025). Proposition 1 consequently positions crisis leadership as a determinant of the organizational conditions under which digital forensic investigation is conducted.

4.2 Digital Forensics as a Foundation for Organizational Learning

The second relationship is about the conversion of incident evidence into organizational knowledge. Digital forensic investigation can reconstruct the sequence of an attack, identify compromised systems, expose control failures, and distinguish immediate technical causes from wider process weaknesses. Its organizational value therefore extends beyond attribution or legal evidence. When forensic findings are incorporated into post-incident review, they provide a factual basis for questioning assumptions about existing controls and identifying where procedures, technologies, or behaviors failed.

This argument is consistent with research showing that learning from cybersecurity incidents is often weakened by superficial causal analysis and limited evaluation of corrective actions (Patterson et al., 2023, 2024). Patterson et al. (2024) further found that organizations can struggle with openness, participation, causal investigation, and implementation when attempting to learn from cyber incidents. Forensic evidence can improve this process by reducing dependence on recollection, speculation, or blame. However, evidence does not constitute learning by itself. Learning occurs when findings are interpreted collectively and converted into revised practices, controls, training, or decision rules. Proposition 2 therefore reflects a knowledge-conversion mechanism: effective digital forensics increases the quality of information available for organizational learning, but organizational processes determine whether that information produces change.

4.3 Leadership as the Mechanism for Translating Forensic Evidence into Change

Proposition 3 extends the framework by arguing that crisis leadership strengthens the relationship between digital forensic investigation and organizational learning. This moderating role is important because the same forensic report can produce very different organizational responses. Leaders may encourage open examination of systemic causes, or they may focus narrowly on individual error. They may allocate resources to implement recommendations, or allow lessons to remain as unimplemented reports. They also influence whether technical findings are communicated to clinical, administrative, governance, and executive audiences in forms that support action.

The organizational learning literature suggests that openness, participation, and willingness to address underlying causes are important to learning from cybersecurity incidents (Patterson et al., 2024). These findings suggest that post-incident learning is partly a leadership problem. Effective crisis leaders can create conditions in which weaknesses can be reported, bring different professional groups into the review process, and ensure that lessons are assigned ownership and follow-up. In healthcare, this is especially important because cyber incidents cross professional boundaries. A failure originating in

information technology can produce consequences in emergency care, diagnostics, medication processes, scheduling, or communication. Leadership therefore performs a translation function between technical evidence and organizational adaptation.

4.4 Organizational Learning and Cyber Resilience

The framework further proposes that organizational learning strengthens cyber resilience. Resilience is not equivalent to restoring systems to their previous condition. A return to the pre-incident state may simply reproduce the vulnerabilities that made the organization susceptible to disruption. Rather, resilience requires adaptation based on what the organization has learned.

Learning can improve cyber resilience through several mechanisms. Forensic findings may lead to redesigned access controls, improved logging, revised escalation procedures, stronger backup arrangements, more realistic downtime protocols, better staff training, or clearer leadership responsibilities. Patterson et al. (2023, 2024) emphasize that learning becomes meaningful when lessons are implemented and their effectiveness is subsequently evaluated. Recent healthcare research similarly emphasize preparedness, response, recovery, and adaptation as important dimensions of cyber resilience. Proposition 4 therefore links organizational learning with resilience through institutionalization. Knowledge generated after an incident must become embedded in routines, structures, technologies, and behaviors that increase the organization's capacity to manage future disruption. In this sense, learning converts a past incident from an isolated adverse event into an input for future organizational capability.

4.5 Cyber Resilience and Patient Safety

The final relationship connects cyber resilience with patient safety. This is central to the framework because the purpose of healthcare cybersecurity is not merely to protect information assets. Digital disruption can interfere with access to electronic records, diagnostics, medication-related processes, scheduling, referrals, communication, and other clinical activities. Van Boven et al. (2024) documented substantial clinical and operational difficulties during hospital ransomware attacks, while Abouk & Powell (2024) found reduced activity at attacked hospitals and increased emergency department activity at nearby hospitals. Recent evidence strengthens this connection. McGlave et al. (2023), using linked ransomware and Medicare claims data, found substantial reductions in hospital volume during the initial attack period and increased in-hospital mortality among patients who were already admitted when an attack began. These findings show the need for cyber resilience to be considered as a patient-safety capability, and not merely an information-security outcome.

Cyber resilience can reduce such risks by enabling organizations to maintain essential clinical functions during disruption and restore digital services in a controlled manner. Resilient healthcare organizations should have tested downtime procedures, alternative communication channels, reliable backups, defined clinical priorities, and cross-functional incident structures. This interpretation is consistent

with the sociotechnical view that healthcare cybersecurity depends on interactions among technology, people, and organizational processes (Ewoh & Vartiainen, 2024). Proposition 5 therefore positions patient safety as the ultimate organizational consequence of cyber resilience.

4.6 The Integrated Conceptual Framework

The five propositions describe a connected post-cyberattack pathway: Crisis leadership → Digital forensic effectiveness → Organizational learning → Cyber resilience → Patient safety
Within this pathway, crisis leadership also strengthens the conversion of digital forensic findings into organizational learning. The framework contributes to existing research in three important ways.

First, it places leadership at the center of post-cyberattack recovery and not just treating cyber response as predominantly technical. Second, it reframes digital forensics as a source of organizational knowledge, beyond evidence for technical, regulatory, or legal purposes. Third, it connects post-incident learning and cyber resilience to patient safety, thereby explaining why leadership and forensic readiness are relevant to healthcare outcomes.

The framework should not be interpreted as a rigid linear sequence. Feedback relationships are likely. Learning from one incident can improve forensic readiness and leadership preparedness for subsequent incidents, while improved resilience may reduce the severity of future disruptions. The model therefore represents a recurring learning cycle in which healthcare organizations can use cyber incidents as inputs for capability development.

The importance of such an approach is reinforced by the changing scale of healthcare cyber risk. Jiang et al. (2025) reported that the number of patient records affected by healthcare data breaches in the United States increased substantially between 2010 and 2024, with hacking and information technology incidents accounting for most affected records by the end of the study period. Prevention remains necessary, but healthcare organizations must also develop the leadership, forensic, learning, and resilience capabilities required to respond when prevention fails. The proposed framework consequently shifts attention from the isolated management of cyber incidents towards an organizational process through which evidence is transformed into learning, resilience, and safer healthcare delivery.

5. Implications

5.1 Theoretical Implications

The proposed framework contributes to several research streams by connecting concepts that have largely been examined separately. First, it extends crisis leadership research into the specific context of healthcare cyberattacks. Existing healthcare crisis leadership studies have primarily examined broader emergencies and organizational disruption (Atkinson et al., 2024; Yang et al., 2024). The present

framework suggests that cyber crises require leaders to manage not only operational continuity and staff coordination but also the preservation, interpretation, and organizational use of digital evidence. Second, the framework extends the organizational role of digital forensics. Digital forensics is commonly associated with evidence collection, incident reconstruction, attribution, and legal or regulatory investigation. The proposed model positions forensic investigation additionally as a knowledge-generating mechanism. Its value therefore depends partly on whether organizations convert forensic findings into changes in structures, routines, technologies, and behaviors. This perspective connects digital forensics with organizational learning and helps explain why technically successful investigations may not necessarily produce stronger organizational capabilities.

Third, the framework contributes to organizational learning and resilience research by proposing a pathway through which learning may emerge after cybersecurity incidents. Patterson et al. (2023, 2024) demonstrate that organizations often experience difficulty translating cyber incidents into sustained learning. The present model suggests that crisis leadership can influence this translation process and that institutionalized learning subsequently contributes to cyber resilience. Finally, positioning patient safety as the ultimate outcome broadens the concept of cyber resilience beyond information-system recovery.

5.2 Managerial and Leadership Implications

The framework has several implications for healthcare managers. Cyber incident preparedness should not be delegated exclusively to information technology or cybersecurity departments. Senior executives, clinical leaders, risk managers, and cybersecurity teams should establish clear decision-making structures before incidents occur. These structures should define responsibilities for clinical continuity, evidence preservation, communication, escalation, and recovery.

Leaders should also treat post-incident review as a learning exercise, and not as a narrow search for individual responsibility. A blame-oriented response may discourage disclosure and limit identification of systemic weaknesses. Instead, forensic findings should be discussed across relevant clinical, technical, and administrative functions and translated into assigned corrective actions. Leadership responsibilities should include ensuring that recommendations are implemented, resourced, and subsequently evaluated.

Healthcare organizations should also strengthen forensic readiness. Appropriate logging, evidence-preservation procedures, documentation standards, and trained personnel can improve the quality of post-incident investigation. Such capabilities should be integrated with business continuity and patient-safety planning instead of being maintained as isolated cybersecurity functions (Nelson et al., 2025).

5.3 Patient Safety and Policy Implications

Cybersecurity preparedness should be more and more considered as part of healthcare safety governance. Evidence that ransomware can disrupt clinical activity and adversely affect patients indicates that cyber incidents can generate consequences comparable to other threats to continuity of care (Abouk & Powell, 2024; McGlave et al., 2023; Van Boven et al., 2024). Healthcare regulators and governing bodies should therefore encourage organizations to integrate cybersecurity resilience, forensic readiness, incident learning, and clinical continuity within institutional risk-management systems.

The framework further suggests that evaluating healthcare cyber resilience should extend beyond technical measures such as recovery time or system availability. Relevant indicators should also consider continuity of critical clinical functions, effectiveness of post-incident learning, implementation of corrective actions, and reduction of risks to patients. Cybersecurity performance can thereby be assessed in terms that reflect more closely the fundamental purpose of healthcare organizations, that is the safe and reliable delivery of care.

6. Suggestions for Future Research

Future research should empirically test the relationships proposed in this framework and examine whether they operate consistently across different healthcare settings. Quantitative studies could develop and validate measures of crisis leadership, digital forensic effectiveness, organizational learning, cyber resilience, and cyber-related patient-safety outcomes. Structural equation modelling would be particularly suitable for testing the sequential relationships proposed in the framework and for assessing the moderating role of crisis leadership in the relationship between digital forensic investigation and organizational learning.

Qualitative research could complement this work by examining how healthcare organizations actually respond to cyber incidents. Interviews with senior executives, clinical leaders, cybersecurity professionals, digital forensic investigators, and patient-safety personnel could provide deeper insight into how forensic findings are interpreted and translated into organizational change. Comparative case studies involving hospitals that experienced ransomware or other major cyber incidents may also help identify leadership behaviors and organizational conditions associated with more effective recovery and learning.

Longitudinal research is especially important because organizational learning and resilience develop over time. Studies could examine how lessons identified immediately after an incident are subsequently implemented, which corrective actions remain in place, and how these changes improve preparedness for later disruptions. This would address an important limitation in current cybersecurity learning

research, which has identified difficulties in evaluating how post-incident actions result in sustained improvement (Patterson et al., 2023, 2024).

Future studies should also investigate contextual factors that may influence the proposed relationships. These may include organizational size, cybersecurity maturity, leadership style, regulatory environment, resource availability, and degree of digital dependence. Cross-country studies could determine whether differences in healthcare infrastructure and cybersecurity regulation alter the effectiveness of post-incident learning.

Finally, research should develop more direct measures of the relationship between cyber resilience and patient safety. Existing studies demonstrate that cyberattacks can disrupt healthcare delivery, but further work is needed to establish how specific resilience capabilities can reduce clinical disruption and patient harm. Empirical validation of these relationships would strengthen the understanding of cybersecurity as both an organizational resilience issue and a core component of modern patient safety.

7. Conclusion

Healthcare cyberattacks are no longer solely technical disruptions. Their consequences can extend across clinical operations, organizational performance, and patient safety. This paper has argued that effective recovery therefore requires more than restoring compromised systems. Healthcare organizations must also understand what occurred, learn from the incident, and translate that learning into stronger capabilities for managing future disruption.

The conceptual framework developed in this paper connects crisis leadership, digital forensic investigation, organizational learning, cyber resilience, and patient safety. Crisis leadership is positioned as an important enabling factor for effective forensic investigation and as a mechanism that strengthens the translation of forensic findings into organizational learning. Digital forensic investigation provides the evidence needed to understand failures and vulnerabilities, while organizational learning determines whether those findings become embedded in revised procedures, technologies, behaviors, and decision structures. Such learning can strengthen cyber resilience and improve the organization's capacity to maintain safe healthcare delivery during future incidents.

The paper therefore extends existing discussions of healthcare cybersecurity by placing leadership and learning at the center of post-incident recovery. It also broadens the role of digital forensics from technical investigation to organizational knowledge generation and connects cyber resilience directly with patient safety. The proposed relationships remain conceptual and require empirical validation. Nevertheless, the framework provides a basis for examining how healthcare organizations can move beyond restoring systems after cyberattacks towards developing stronger, more adaptive, and safer organizations. In this sense, the aftermath of a cyberattack should be treated not only as a period of recovery but also as an opportunity for structured organizational learning and resilience development.

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