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Reimagining Financial Reporting: The XBRL Evolution through Systematic Review

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Abstract

This study provides a systematic literature review (SLR) on the adoption and impact of eXtensible Business Reporting Language (XBRL), highlighting its potential and challenges. Following a systematic review protocol, literature was collected from the Web of Science database, focusing on the adoption, implementation, and outcomes of XBRL in various regions and industries. The final sample included 155 research articles published between 2002 and 2025, which were analyzed for methodologies, findings, and implications. XBRL has been widely adopted to enhance transparency, comparability, and efficiency in financial reporting, driven largely by regulatory mandates across various countries. The review reveals a diverse range of outcomes associated with XBRL adoption, including improvements in market efficiency, reduced information asymmetry, and reduce audit report lag. However, the findings also point to inconsistent effect, such as increased complexity in financial reporting, heightened costs for smaller firms, and variable effects on analyst forecast accuracy. Moreover, factors such as firm size, technological capacity, and regulatory pressures are consistently found to be key drivers, while perceived complexity and costs serve as significant barriers. Interestingly, the interaction between these factors and individual or organisational characteristics, such as training and experience, suggests that the challenges of XBRL adoption may be mitigated through targeted training and support. This study provides a comprehensive analysis of the state of XBRL research, highlighting gaps and offering insights into factors that influence its adoption and impact. It serves as a guide for future research on digital financial reporting.

Keywords: Extensible Business Reporting Language, Xbrl Adoption, Financial Reporting, Transparency, Audit Efficiency

Introduction

In rapid innovation in technology and digitalised society, the capacity to effectively exchange and analyse financial data is crucial for firms, regulators, and investors. Electronic reporting and automated fundamental reviews in the field of financial reporting are becoming increasingly important considering the difficulties and error-prone procedure of manual analysis from the available source of information. The eXtensible Business Reporting Language (XBRL) provides a standardised platform for this activity, which supports automated and digitalised reviews compared to the paper-based reports from the previous manual (Suta & Tóth, 2020). It is a globally recognised as an open standard language used for digital accounting and business reporting.

First, it was introduced in 1999 as a framework based on XML that allows for standardised reporting of financial statements and became a crucial tool for standardising the electronic disclosure of commercial and financial data. Since 2009, the U.S. Securities and Exchange Commission (SEC) has mandated that public firms submit their financial statements in XBRL format. This requirement highlights the significance of the technology in ensuring compliance with regulations (Debreceny et al., 2010). Furthermore, the European Union has enforced the utilisation of XBRL for financial institutions as a component of the European Single Electronic Format (ESEF) law. So far, more than 50 countries have voluntarily or mandatorily adopted XBRL as a standard language for public firms to prepare their financial reports (Azhar & Subramanian, 2022).

XBRL promotes transparency and comparability among various companies and jurisdictions. Companies are transitioning from traditional paper-based formats like PDF or HTML to a more interactive and dynamic approach for presenting business information. It has been suggested that the XBRL format increases disclosures and transparency, leading to an increase in overall financial reporting quality (Blankespoor et al., 2014; Pinsker & Li, 2008). XBRL mandate improved information acquisition (Chen & Zhou, 2019), accessibility (Yen & Wang, 2015), internal controls (Amin et al., 2018), enhanced market reactions to earnings surprises (Yen & Wang, 2015), and reduced auditing costs (Shan & Troshani, 2014). Generally, regulators tend to use XBRL to enhance the transparency of capital markets for actual and potential investors (Borgi & Tawiah, 2022). Also, Kim et al. (2012) showed that adopting XBRL technology in the financial reporting process leads to better disclosure and lower information asymmetry.

In contrast with regulators' enthusiasm, academics have debated the benefits and costs of XBRL adoption. Although XBRL has been widely adopted, there are still problems in its implementation and utilisation. Companies frequently encounter challenges associated with the intricacy of taxonomy, the expenses of implementation, and the necessity for continuous revisions to stay abreast of evolving regulatory standards (Pinsker & Li, 2008). Furthermore, the impact of XBRL on enhancing the quality of financial reporting and decision-making has been a topic of academic investigation, with varying results documented in the literature. Despite the potential benefits, the costs associated with adopting and maintaining XBRL can be substantial, particularly for smaller firms. These costs include the need for additional software, hardware, and specialised knowledge, which can be a barrier to effective adoption (Cordery et al., 2011). In some regions, the mandatory adoption of XBRL has not yet led to

widespread awareness or a substantial impact on real practice. Many professionals remain unaware of XBRL's full potential, limiting its effectiveness.

Additionally, while the existing reviews on XBRL has expanded significantly over the past two decades, they are not without limitations in terms of the coverage or focus (either conceptual synthesis, narrow theoretical applications, or regional). For instance, Mokodompit et al. (2025) adopted an institutional lens and focus on isomorphic pressures, using a meta-analytic approach to examine how coercive, mimetic, and normative forces drive XBRL adoption across economic contexts. Similarly, El Ansary et al. (2020) explored determinants of XBRL adoption but center their synthesis on technology acceptance and organizational capabilities, with empirical emphasis on the Moroccan setting. In contrast, this study employs a comprehensive systematic literature review (SLR) encompassing 155 articles across multiple regions and theoretical lenses to explore the multifaceted implementation, challenges, and outcomes of XBRL adoption. Moreover, unlike Lombardi and Secundo (2021) and Schiavi et al. (2024), who broadly discuss digital transformation and institutional change, this study is focused solely on XBRL, synthesizing its evolution, practical hurdles, and contextual factors influencing its efficacy. Perdana et al. (2015) provided an integrative review of XBRL literature, classifying studies across domains such as financial reporting, decision-usefulness, and implementation. While valuable for its early synthesis, their work is now somewhat dated, covering literature only up to 2014. Similar to Hoitash et al. (2021) which cover literature till 2020.

Our work extends beyond prior frameworks by integrating adoption determinants, outcome heterogeneity, theoretical plurality, and cross-country regulatory timelines, providing a more nuanced foundation for future research and policy design in digital financial reporting. Given the limitations of prior reviews, this systematic literature analysis seeks to offer a thorough and up-to-date review of the current XBRL literature. To do this, we followed a systematic approach to collect the sample literature from the Web of Science (WOS) database. It analyses the implementation, advantages, difficulties, and influence of XBRL on financial reporting and decision-making. It serves as a guide for future research and practice in the subject of digital financial reporting.

The significance of XBRL stems from its status as a globally recognized framework for the electronic exchange of business and financial information, aimed at improving the efficiency, accuracy, and transparency of financial reporting. Developed in the late 1990s, it was created to meet the growing demand for enhanced efficiency and transparency in financial reporting. As an extension of the Extensible Markup Language (XML), XBRL allows for the standardized formatting and tagging of financial data, simplifying the process for businesses to report information that can be easily accessed, analyzed, and compared by various stakeholders, including regulators, investors, and analysts (Alles, 2021; Kim, et al., 2019). The impetus for this technology's development was the increasing complexity of financial data and the rising necessity for timely financial information (Howard & Zhou, 2021). The rationale for the establishment of XBRL and the current study is to overcome the shortcomings of traditional financial reporting, which frequently involved labor-intensive procedures and produced information that was challenging to extract and analyze efficiently. By implementing XBRL, companies can greatly decrease the manual labor needed to input and process data, thus reducing errors and enhancing the overall quality of financial information (Debreceny et al.,

2010). Furthermore, XBRL supports continuous reporting, providing real-time access to financial data, which is essential in today's rapidly evolving business landscape (Borgi & Tawiah, 2022).

It is crucial to highlight that the current study, which focuses on XBRL in both leading and emerging economies, holds significant importance for the economic landscape of these nations. While XBRL is not a novel concept, its relevance was heightened in 2021 and beyond. Across Europe and globally, regulators are increasingly adopting a digital-first compliance approach, positioning XBRL as the standard for financial, sustainability, insurance, and even VAT reporting. Furthermore, building on the aforementioned benefits, an increasing number of countries have adopted XBRL as a regulatory standard, either voluntarily or mandatorily, to modernize financial disclosure systems and improve transparency in capital markets. The United States spearheaded this global initiative, with the SEC introducing a voluntary XBRL filing program as early as 2004, followed by mandatory implementation for large public companies in 2009. The regulatory momentum in the UK commenced in 2011 and has evolved with updates to the UK GAAP taxonomy, incorporating environmental, social, and governance considerations by 2023. Emerging economies like China and Malaysia were also early adopters; China mandated XBRL filings for listed companies in 2010, while Malaysia launched the Malaysian Business Reporting System platform in 2018. These initiatives reflect a state-led strategy to digitize financial reporting, in line with broader reforms aimed at enhancing capital market transparency. This study has potential significance for other emerging economies, such as Saudi Arabia, which has demonstrated a phased and highly coordinated approach, transitioning from planning (2015--2016) to full implementation. Jordan and Egypt have also recently followed this trend, with the Egyptian Exchange set to initiate platform development by 2024. The timeline reveals two significant inflection points in the global XBRL journey: firstly, the transition from voluntary to mandatory filing systems, particularly between 2009 and 2011 in advanced markets; and secondly, the recent growth of XBRL into ESG and green finance reporting, which gained traction after 2022 in alignment with global sustainability initiatives. This progression not only emphasizes the technological convergence of financial and non-financial reporting but also highlights the institutional diversity in adoption pathways, with regulatory leadership playing a pivotal role in influencing the speed, scope, and integration of implementation with local accounting frameworks.

It is important to note that the effectiveness of XBRL is heavily dependent on the precision of the tagging process. Mistakes in tagging can result in data misinterpretation, thereby diminishing the reliability of the financial information presented (Troshani & Lymer, 2010). To ensure high data quality, rigorous validation processes are necessary, which can be both time-consuming and expensive. Although XBRL seeks to standardize financial reporting, variations in regulatory requirements across different countries can lead to inconsistencies in its application (Markelevich et al., 2021). This inconsistency can hinder the objective of achieving global comparability of financial data. Local discrepancies in XBRL taxonomies can further complicate cross-border reporting and analysis. Nevertheless, the impact of XBRL remains uncertain and diverse due to limited research and a lack of comprehensive understanding of the topic. Despite its growing popularity, XBRL has not achieved widespread adoption; stakeholder engagement is minimal, and very few organizations have voluntarily implemented XBRL in practice. The limited research conducted in this area has yielded conflicting findings (Astafeva et al., 2020; Shan & Troshani, 2016). Additionally, the

implementation of XBRL has faced numerous challenges. Organizations have encountered difficulties in implementing XBRL, including the necessity for extensive training and adjustments to their existing reporting systems (Janvrin et al., 2013). Furthermore, the intricacies involved in managing and updating XBRL taxonomy can place a considerable strain on organizations. Although XBRL has the potential to improve data transparency, it also requires a significant initial investment in technology and personnel training. Rao and Guo (2022) contended that while preparers are typically capable of learning and enhancing their skills over time, XBRL as a communication technology may still be misused, consequently impacting data quality. This current study illuminates the various aspects of XBRL, including its effectiveness, the inconsistencies in its application, local variations in XBRL taxonomies, and the uncertain and diverse impact of XBRL, which is attributed to limited research and a lack of thorough understanding of the subject. The study also addresses how XBRL can achieve widespread adoption, maximize stakeholder engagement, and ultimately how the implementation of XBRL can overcome the numerous challenges it encounters. Moreover, this study makes several important contributions to understanding XBRL in the context of financial reporting, digitalisation, and regulatory compliance. It offers a detailed examination of the implementation of XBRL across different regions and industries. By systematically analysing the literature, it highlights the diverse experiences of firms, particularly in terms of the challenges they face with XBRL adoption. This includes the complexities associated with taxonomy, the significant costs of implementation, and the ongoing need for updates to align with changing regulatory standards. This level of detail provides a nuanced understanding of the practical realities of XBRL adoption beyond the general discussions of its benefits. The study critically evaluates the evidence of XBRL's impact on financial reporting quality and decision-making. It synthesises findings from various studies that have produced mixed results, offering insights into why XBRL may enhance financial reporting in some contexts but not others. This analysis helps to clarify the conditions under which XBRL is most effective, contributing to a more targeted application of XBRL in practice. The systematic approach used in this study consolidates existing knowledge and identifies areas where further research is needed. It serves as a guide for future studies to explore unresolved issues, such as the long-term cost-benefit analysis of XBRL adoption and its impact on smaller firms. This contribution is essential for advancing the field and ensuring that future research addresses the most pressing challenges related to XBRL.

The organisation of this article is as follows: The first section provides an introduction to the study's objectives and the importance of XBRL in modern financial reporting. second section present an overview about XBRL. The third section outlines the methodology used for the systematic literature review. The fourth section presents the findings of the study, followed by a discussion in the fifth section that integrates these findings with existing research. The final section concludes the study and suggests directions for future research.

XBRL Background

XBRL is a globally recognised framework for the electronic communication of business and financial data designed to enhance financial reporting efficiency, accuracy, and transparency. It was developed in the late 1990s to address the demand for improved efficiency and transparency in financial reporting; as an extension of the Extensible Markup Language (XML), XBRL enables the standardised formatting and tagging of financial data, making it easier for businesses to report information that can be readily accessed, analysed,

and compared by various stakeholders, including regulators, investors, and analysts (Alles, 2021; Kim, et al., 2019). The development of this technology was motivated by the rising intricacy of financial data and the escalating need for timely financial information (Howard & Zhou, 2021).

XBRL is created to address the limitations of traditional financial reporting, which often involved labour-intensive processes and resulted in information that was difficult to extract and analyse efficiently. By using XBRL, firms can significantly reduce the manual effort required to input and process data, thereby minimising errors and improving the overall quality of financial information (Debreceny et al., 2010). Moreover, XBRL facilitates continuous reporting, allowing real-time access to financial data, which is crucial in today's fast-paced business environment (Borgi & Tawiah, 2022).

Building on these advantages, a growing number of countries have embraced XBRL as a regulatory standard (either voluntarily or mandatorily) to modernize financial disclosure systems and enhance transparency in capital markets. As summarized in Table 1, the United States led the global movement with the SEC launching a voluntary XBRL filing program as early as 2004, followed by mandatory implementation for large public companies in 2009. The UK's regulatory momentum began in 2011 and evolved with updates to UK GAAP taxonomy and the inclusion of environmental, social, and governance considerations by 2023. Emerging economies such as China and Malaysia were also early adopters, with China mandating XBRL filings for listed companies in 2010 and Malaysia launching the Malaysian Business Reporting System platform in 2018. These efforts reflect a state-led approach to digitizing financial reporting, aligned with broader reforms in capital market transparency. Other emerging economies such as Saudi Arabia demonstrated a phased and highly coordinated approach, moving from planning (2015--2016) to full implementation. Jordan and Egypt followed suit more recently, with Egyptian Exchange initiating platform development by 2024. The timeline indicates two major inflection points in the global XBRL journey: first, the shift from voluntary to mandatory filing systems, particularly around 2009--2011 in advanced markets; and second, the recent expansion of XBRL into ESG and green finance reporting, which gained momentum post-2022 in line with global sustainability initiatives. This evolution underscores not only the technological convergence of financial and non-financial reporting, but also highlights the institutional diversity in adoption pathways, with regulatory leadership playing a critical role in shaping implementation speed, scope, and integration with local accounting frameworks.

It should be noted that the effectiveness of XBRL relies heavily on the accuracy of the tagging process. Errors in tagging can lead to misinterpretation of data, reducing the reliability of the financial information provided (Troshani & Lymer, 2010). Ensuring high data quality requires rigorous validation processes, which can be time-consuming and costly. While XBRL aims to standardise financial reporting, differences in regulatory requirements across countries can lead to inconsistencies in its implementation (Markelevich et al., 2021). This can undermine the goal of achieving global comparability of financial data. Local variations in XBRL taxonomies can complicate cross-border reporting and analysis. However, the effect of XBRL is still uncertain and varied due to limited investigation and a lack of understanding of the subject. Despite its popularity, XBRL has not widely diffused, there is little stakeholder

engagement, and very few organisations have voluntarily adopted XBRL in practice. The limited number of studies conducted on this topic have produced conflicting results (Astafeva et al., 2020; Shan & Troshani, 2016). Furthermore, the implementation of XBRL has encountered various problems. Companies have faced challenges in adopting XBRL, such as the need for comprehensive training and modifications to their current reporting systems (Janvrin et al., 2013). Additionally, the complexity of managing and revising XBRL taxonomy can impose a substantial burden on organisations. While XBRL can enhance data transparency, it also necessitates a significant upfront investment in technology and staff training. Rao and Guo (2022) argued that although preparers are generally able to learn and improve over time, XBRL as a communication technology may still be used badly and, as a result, affect data quality.

Table 1
Timeline of XBRL adoption and key regulatory milestones across countries

Year	USA	UK	Malaysia	Saudi Arabia	China	Jordan	Egypt	South Africa
2004	SEC launches voluntary XBRL filing program							
2008					First XBRL taxonomy released by MOF			
2009	Mandatory XBRL filings begin for large public companies							
2010					Mandatory XBRL filings for listed companies on SSE/SZSE			
2011		Mandatory XBRL filings of Corporation Tax						
2014		UK GAAP Taxonomy updated by FRC						
2015				Listed firms must submit annual financials (balance sheet, income statement, cash flow statement) and auditor reports in XBRL format.				
2016				listed companies must submit full annual				

				financials, notes, the auditor's report, and the board report in XBRL format.				
2018	SEC adopts Inline XBRL for operating companies and mutual funds		Launch of Malaysian Business Reporting System XBRL platform by SSM				EGX announces plans for XBRL disclosure system	CIPC mandates use of Inline XBRL for qualifying entities
2019			Phased mandatory XBRL submission for companies begins					
2020		Bank of England adopts XBRL for CRD IV reporting						
2022			SC implements XBRL for sukuk and bond reporting		Green finance and ESG disclosures via XBRL piloted			
2023	Expansion into ESG and structured disclosures begins		Discussion on ESG reporting using XBRL begins		Plans to align XBRL ESG disclosures with ISSB/TCFD	94% of listed companies use XBRL for annual reports	EGX announces plans for XBRL disclosure system	
2024							Development of platform by EGID begins	CIPC introduces updated XBRL taxonomy including sustainability disclosures
2025							Mandatory XBRL filings expected for listed firms	

Methodology

A systematic literature review (SLR) has been conducted which is rigorous and structured to review existing research on XBRL. Unlike traditional literature reviews, which may be more narrative and selective in nature, an SLR follows a predefined methodology to ensure that the review process is comprehensive, unbiased, and reproducible (Khatib et al.,

2022, 2023). The goal of SLR is to synthesise existing knowledge, identify gaps in the literature, and provide a clear, evidence-based understanding of the XBRL issues.

Research Strategy

As shown in Figure 1 a systematic approach to identify the sample of literature was conducted from the Web of Science (WOS) database. WOS covers a broad range of disciplines, including finance, accounting, and information systems, which are critical for a comprehensive review of XBRL literature. Following other studies (i.e., Moreira et al., 2019), WOS's coverage of high-impact and peer-reviewed journals across accounting, finance, and information systems, ensuring the inclusion of influential and high-quality research. It includes journals of high impact, ensuring that the review captures influential studies across various fields relevant to XBRL (Fayad et al., 2024; Khatib et al., 2022). The initial search terms, "XBRL*" OR "eXtensible Business Reporting Language," are comprehensive, capturing a broad range of studies related to XBRL. The use of an asterisk (*) allows for the inclusion of variations and extensions of the term XBRL, ensuring that the search includes all relevant literature. This initial search yielded a total of 467 articles, covering a wide array of publications related to XBRL.

Inclusion and Exclusion Criteria

To ensure that the articles were accessible and understandable to the research team, the search was restricted to publications written in English. This step reduced the number of articles to 451 studies. The decision to focus on English-language publications was based on the author language capabilities and the fact that English is the predominant language of academic discourse in the fields of management and economics.

The search results were further refined by excluding non-journal publications, such as conference proceedings, restricted documents, and other publication types. This refinement was critical to maintaining the quality and relevance of the data, as journal articles typically undergo a more rigorous peer-review process compared to other types of publications. This filtering further reduced the dataset to 278 articles. To align the study with its specific research objectives, the search was narrowed down to include only those articles that were categorised under the disciplines of management and economics. This step ensured that the articles selected were directly relevant to the study's focus on the influence of XBRL on sustainability performance. Additionally, a specific emphasis was focused on articles related to sustainable performance, further refining the search to a total of 194 articles.

Data Cleaning and Extraction

As the final step in the data collection process, all studies that did not explicitly address XBRL as the main construct were carefully reviewed and excluded from the dataset. This refinement was crucial to ensure that the analysis would be focused on studies directly relevant to the research objectives. After this filtering process, the final sample consisted of 155 research articles. These articles formed the core of the analysis in this study. Each of these studies was systematically analysed and discussed to explore XBRL facets. The analysis included examining the methodologies, findings, and implications of each study, providing a comprehensive overview of the current state of research on XBRL. This approach allowed for a thorough and focused discussion, ensuring that the research contributes meaningful insights to the ongoing academic debate surrounding XBRL.

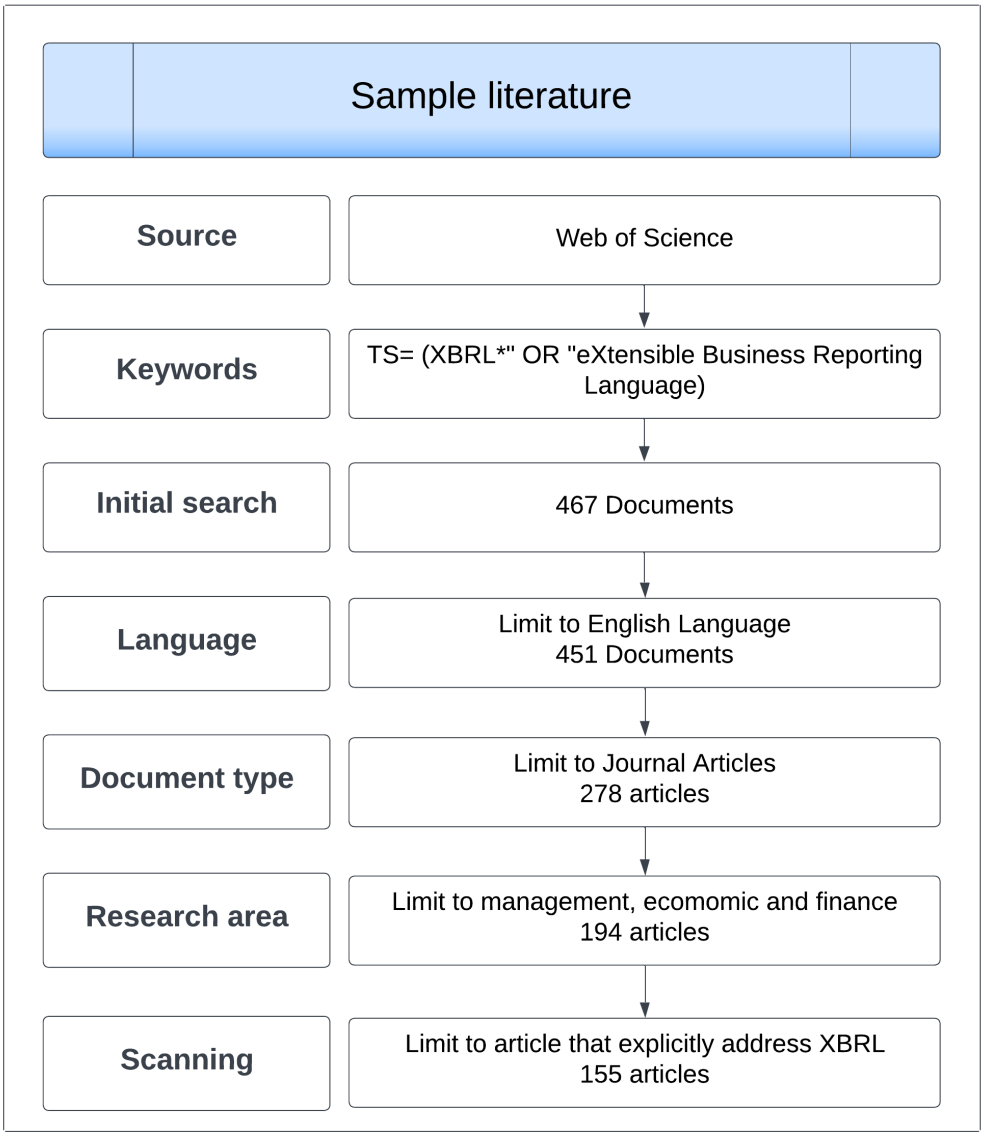

Figure 1: Data collection process

Result and Discussion

This section presents and interprets the key findings from the 155 reviewed articles on XBRL. It highlights trends in publication, geographical focus, theoretical frameworks, and practical implications. The discussion aims to identify key drivers, challenges, and outcomes of XBRL adoption across various contexts.

Publication Trend

As shown in Figure 2, the XBRL literature spans from 2002 to 2025, showing a clear trend in the volume of publications on this topic. The initial years, from 2002 to 2017, show a very low number of publications, indicating that XBRL was still an emerging topic with limited academic attention as this phase corresponds with the early development and conceptualization of XBRL as a reporting language. There was a gradual increase in the

number of publications starting around 2011, with a noticeable peak in 2021. This phase reflects institutional isomorphism at play, where coercive pressures from regulators, especially in the EU and the USA (e.g., SEC XBRL mandate in 2009), began influencing adoption. Growth in research was also driven by data availability and systematization of taxonomies, enabling richer empirical analyses.

The trend suggests that XBRL research has moved from its initial exploratory phase to a mature stage where the foundational aspects of the technology have been extensively studied. The peak in 2021 may reflected by the widespread regulatory adoption (e.g., European Single Electronic Format mandate), availability of data, integration with ESG reporting, sustainability disclosures, and digital transformation agendas. However, future research may further evolve toward XBRL-ESG integration, machine learning-based tagging, and automated assurance systems, suggesting that while volume may plateau, thematic innovation is likely to continue.

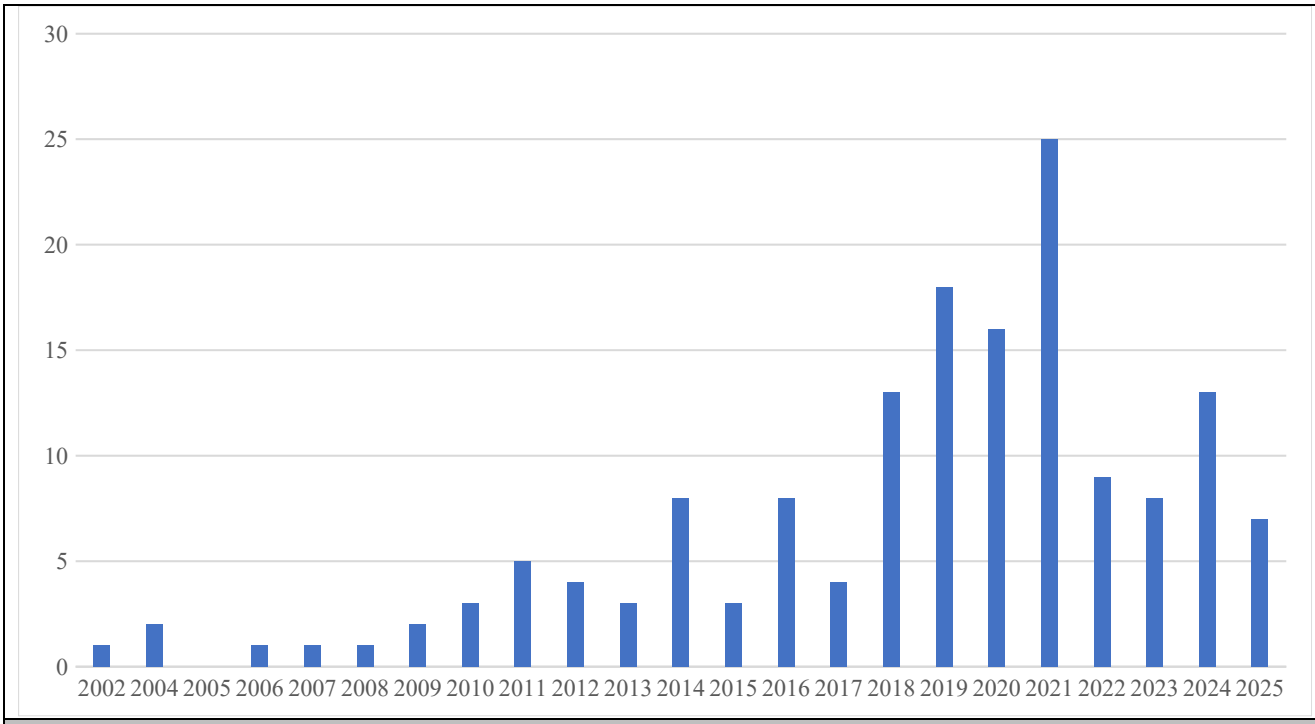

Figure 2: The number of studies per year

Research Settings

Table 2 highlights the evolving landscape of XBRL research over time, with a clear trend towards more quantitative (with 91 studies) and data-driven studies, especially in more recent years. Quantitative methods have dominated the XBRL research landscape. These methods typically involve statistical analysis, econometric modelling, or large-scale data analysis. The increase in the use of quantitative methods suggests that XBRL research is increasingly data-driven, likely due to the vast amounts of structured data that XBRL itself provides. For example, studies in this category often explore the impact of XBRL on financial reporting quality, market efficiency, or the reduction of information asymmetry (e.g., Kim & Lee, 2025; Luo et al., 2023; Sanad, 2024). They leverage XBRL datasets to perform regressions or other statistical tests, providing empirical evidence of the benefits or challenges associated with XBRL adoption (e.g., Liu et al., 2014; Rao & Guo, 2022). It should be noted that

quantitative studies that utilise surveys are relatively underrepresented in the research on XBRL compared to studies based on secondary data (i.e., Ashoka et al., 2020; Debreceny et al., 2020; Henderson et al., 2012; Kumar et al., 2019; N et al., 2024). While secondary data studies dominate the field, particularly through the analysis of existing financial reports and large datasets, survey-based research plays a crucial role in capturing subjective and context-specific insights that secondary data may overlook.

Qualitative studies are invaluable in XBRL research as they provide rich, detailed insights into the complex, context-dependent factors that influence the adoption, implementation, and impact of XBRL. Studies that are qualitative and not based on empirical evidence are less common. The number of qualitative research studies reached its highest point between 2011 and 2015, with a total of 12 studies (Chen, 2012; Locke et al., 2018; Troshani et al., 2015, 2018, 2019; Troshani & Lymer, 2010). By focusing on the human, organisational, and contextual elements, qualitative research complements quantitative studies and offers a more nuanced understanding of how XBRL can be effectively integrated into financial reporting practices. For example, Troshani et al. (2015) and Troshani et al. (2018) provide deep insights into the contextual factors that influence the adoption and implementation of XBRL. These studies focus on how organisational culture, regulatory environments, and institutional pressures shape the process of XBRL adoption. Also, Troshani and Lymer (2010) and Locke et al. (2018) delve into the interactions between various actors (e.g., regulators, firms, and technology providers) during the standardisation and implementation processes. These studies highlight the importance of aligning technical and social aspects of XBRL, illustrating how different stakeholders contribute to or resist the adoption process. They also shed light on the challenges of translating traditional reporting practices into digital formats, emphasising the role of organisational dynamics in technology adoption.

Although applied methods have advanced the field, we believe the duality between methodological rigor and contextual richness remains underexplored in an integrated manner. A more interdisciplinary and mixed-method approach could significantly enhance the field's ability to explain both the 'what' and the 'why' of XBRL phenomena. Future studies should strive to bridge this gap by not only combining methods but also cross-fertilizing insights drawn from behavioural sciences, institutional theory, and information systems.

Several studies (e.g., S. Chen et al., 2021; Qi et al., 2018; Ruan et al., 2021) also distinguish between state-owned enterprises (SOEs) and non-SOEs, particularly in China, to assess how ownership structure mediates the effects of XBRL adoption. Moreover, some research isolates private companies (Alkhatib et al., 2019; Kaya & Pronobis, 2016), small and medium-sized enterprises (SMEs) (Faccia et al., 2021), and financial institutions (Kumar et al., 2019; Mansour et al., 2025) to investigate whether the benefits and challenges of XBRL adoption differ based on firm size and disclosure obligation.

Firm size emerges as a critical determinant in both the adoption implementation and the post-adoption outcomes. Larger firms often demonstrate smoother implementation and derive greater benefits from XBRL, such as reduced audit fees (Shan & Troshani, 2014), improved analyst forecast accuracy (Liu et al., 2014), and enhanced market responsiveness (Bhattacharya et al., 2018). In contrast, smaller firms face greater compliance challenges,

including increased filing complexity and reliance on third-party service providers, which may dilute reporting quality and increase extension errors (Zvekan, 2025; Li et al., 2021). Some studies also indicate that XBRL adoption is not a one-size-fits-all solution, as the technology's complexity may inadvertently disadvantage smaller reporting entities (Zhou, 2020; Blankespoor et al., 2014).

While existing research adequately explores heterogeneity across firm types and sizes, there is still insufficient coverage of financial institutions, family-owned firms, and emerging market SMEs, whose digital reporting behaviors and constraints remain under-investigated. Future studies would benefit from examining sector-specific differences (e.g., technology-intensive vs. traditional industries) and hybrid organisational forms (e.g., partially state-owned listed firms), especially in regions with mixed institutional environment. Such exploration could provide a more granular understanding of how firm characteristics interact with regulatory, technological, and governance contexts to shape XBRL outcomes.

Geographical Distribution

Panel B of the table demonstrates that a significant number of studies are concentrated in the United States, reflecting the early adoption and strong regulatory push for XBRL by the SEC. These studies cover a wide range of topics, from the impact on analyst behaviour to the efficiency of financial reporting. The USA's advanced financial market and regulatory framework provide a rich context for studying the implications of XBRL, making it a focal point for XBRL research.

However, subsequent studies have progressively shifted their attention to other nations such as China, Indonesia, and India. Notably, there has been a significant rise in research on these countries in recent years as more countries are enforcing the XBRL reporting. China, the second-largest economy globally, and India, with its rapidly growing economy and emphasis on improved financial transparency, provide useful observations on the integration of modern financial reporting systems in developing countries (Liu et al., 2017; Singh & Singh, 2022). Several studies adopt a comparative or cross-country perspective, comparing the effects of XBRL adoption across different legal, economic, and institutional settings (i.e., Shan & Troshani, 2021; Tawiah & Borgi, 2022).

It has been found that the adoption of XBRL differs between countries due to the differences in economic level, technology absorption and investor protection (Borgi & Tawiah, 2022; Mokodompit et al., 2025; Sassi et al., 2024). Similarly, the extent of internal audit function involvement in XBRL implementation also varies across contexts, influenced by these same institutional and economic factors (Abdolmohammadi et al., 2017). Hence, more research should emphasise longitudinal and multi-level analyses to explore institutional change, stakeholder adaptation, and performance outcomes in varied regulatory and cultural environments. There is also a need to understand the micro-level dynamics of XBRL adoption within firms, governance, resource allocation, and audit quality, across different national contexts. For instance, it was reported that XBRL is associated with an increased financial reporting quality. However, the relationship is stronger in developing countries than in developed countries (Tawiah & Borgi, 2022). Also, the impact of the mandatory adoption of XBRL on firms' stock liquidity is more pronounced in civil law countries than in common law

countries (Sassi et al., 2020).

Table 2
The research settings of the sample literature

Item	No. Studies	pre-2005	2006-2010	2011-2015	2016-2020	2021-2025	Example studies
Panel A: Method							
Quantitative	101	1		12	38	50	(Hodge et al., 2004; J. A. Johnston et al., 2023; Zhang et al., 2019)
Qualitative	12		1	2	6	3	(Y. C. Chen, 2012; ILIAS et al., 2021; Troshani et al., 2015)
Non-empirical	25	1	6	5	10	3	(Alles, 2021; Alles & Piechocki, 2012)
Descriptive	5		1	2	2		(Helfaya & Amin, 2020; Saeid Homayoun, 2011)
Review	12	1		2	3	6	(Bartolacci et al., 2020; Mokodompit et al., 2025)
Panel B: Countries							
USA	65	1	2	9	31	22	(Hsieh et al., 2019b; B. Li et al., 2020)
Global	16		1	1	5	9	(Sassi et al., 2024; Tawiah & Borgi, 2022)
China	12			3	5	4	(Chou et al., 2016; Tian et al., 2025)
India	5				2	3	(Abhishek et al., 2024; Kumar et al., 2019)
Indonesia	7				1	6	(Saragih & Ali, 2023; Ulupui et al., 2022)
Australia	6		3	1	2		(Fahy et al., 2009; Robb et al., 2016)
Jordan	4					4	(Humeedat, 2024; Mansour et al., 2025)
Malaysia	4			1		3	(ILIAS et al., 2021; Saeid Homayoun, 2011)
UK	3			1	2		(Alkhatib et al., 2019; Dunne et al., 2013)
Turkey	2				1	1	(Aksoy et al., 2021; Yılmaz et al., 2020)
No Country*	24	1	1	4	6	8	(Mosteanu & Faccia, 2020; Schiavi et al., 2024)
Others**	7			1	4	2	(Helfaya & Amin, 2020)

* This includes review and non-empirical studies that do not have geographical location.
**Other countries with one study only are South Korea, Belgium, New Zealand, Canada, the UK, UAE, Egypt, Uruguay, South Africa, Spain, Japan and Finland.

Theories Applied in XBRL Studies

Theoretical frameworks play a crucial role in guiding and interpreting research on XBRL. The application of various theories in prior studies reflects the multi-faceted nature of XBRL and its implications in the fields of accounting, information systems, and organisational behaviour. Table 3 provides an overview of the predominant theories used in XBRL research over different periods.

Agency theory has been prominently featured, particularly from 2011 onwards, due to its relevance in exploring issues of information asymmetry and principal-agent problems inherent in financial reporting. This theory's focus on the conflicts of interest between

managers (agents) and shareholders (principals) (Khatib, 2024a, 2024b) makes it suitable for examining how XBRL can reduce information asymmetry and improve transparency (Chen et al., 2018; Saragih & Ali, 2023). However, the limitations of agency theory lie in its often reductionist view of organisational behaviour, where it assumes that all actors are primarily motivated by self-interest. This oversimplification neglects other motivational factors, such as ethics, professional norms, and regulatory compliance, which can also influence how XBRL is implemented and utilised.

Institutional theory has gained traction in more recent studies (2016-2024), reflecting the recognition that the adoption and diffusion of XBRL are not merely technological decisions but are also deeply influenced by institutional pressures such as regulation, professional norms, and market expectations (Rao & Guo, 2022; Tawiah & Borgi, 2022). However, institutional theory often overlooks the role of individual agency and the potential for resistance within organisations, limiting its ability to capture the dynamic interactions between technology and organisational change fully.

The technology acceptance model (TAM) and the diffusion of innovation theory have also been employed, particularly in studies focusing on the adoption and acceptance of XBRL technology (Uyob et al., 2023). These theories are valuable for understanding the factors that influence the acceptance of XBRL by individual users or organisations, such as perceived ease of use and perceived usefulness. However, these theories tend to focus on the initial stages of technology adoption and may not adequately address the long-term integration and impact of XBRL within organisations. Additionally, these models often assume a linear progression of technology adoption, which may not accurately reflect the complex, iterative process that can occur in practice.

Table 3
Theories applied in literature

Item	pre-2005	2006-2010	2011-2015	2016-2020	2021-2024	No. Studies
Agency Theory				2	6	8
Institutional Theory					6	6
Technology Acceptance Model					3	3
Diffusion of Innovation Theory			1		2	3
Signaling Theory			1	2		3
Resource-Based Theory				3		3
Learning Curve Theory					2	2
Other Theories				6	11	17

Other theories are Economic theory, Market Efficiency Theory, mosaic theory of–organisation–environmental framework, Decomposed Theory of Planned Behavior, Unified Theory of Acceptance and Use of Technology, Processing fluency theory, organizational-capability theories, signal transmission theory, random walk theory, stewardship theory Bunching theory, Transaction cost theory, voluntary disclosure theory, Task-Technology Fit theory, and TAM 3.

Signalling theory has been used to explore how XBRL can serve as a signal to external stakeholders about the quality and reliability of financial reporting. This theory is particularly relevant in examining how early adopters of XBRL can differentiate themselves in the market (Ulupui et al., 2022, 2023). However, signalling theory's focus on external perceptions can sometimes neglect the internal challenges and organisational changes required to implement XBRL effectively. Resource-based theory and learning curve theory have been applied to understand the internal capabilities and knowledge accumulation processes that influence XBRL adoption (Hsieh et al., 2019; Johnston et al., 2023; Liu et al., 2017). These theories emphasise the importance of organisational resources, such as expertise and technology infrastructure, in the successful implementation of XBRL. Nevertheless, these theories often fail to account for external factors, such as regulatory pressures or industry trends, that can also significantly impact XBRL adoption and utilisation.

Each of those theories has its limitations, often focusing on specific aspects of XBRL while neglecting others. Given the complex nature of XBRL, no single theoretical framework can comprehensively capture all its facets. The limitations of individual theories suggest the need for a multi-theoretical approach to better understand the full range of issues related to XBRL. This review proposes an integrated conceptual framework (Figure 3) that brings together these multi-level perspectives. This framework bridging macro-level (institutional/economic), meso-level (organisational), and micro-level (individual/behavioural) theories. For example, combining agency theory with institutional theory could provide a more holistic view of both the economic motivations for XBRL adoption and the institutional pressures that drive it. Similarly, integrating technology acceptance models with resource-based views could offer insights into both the individual-level factors that influence XBRL adoption and the organisational capabilities required for its successful implementation.

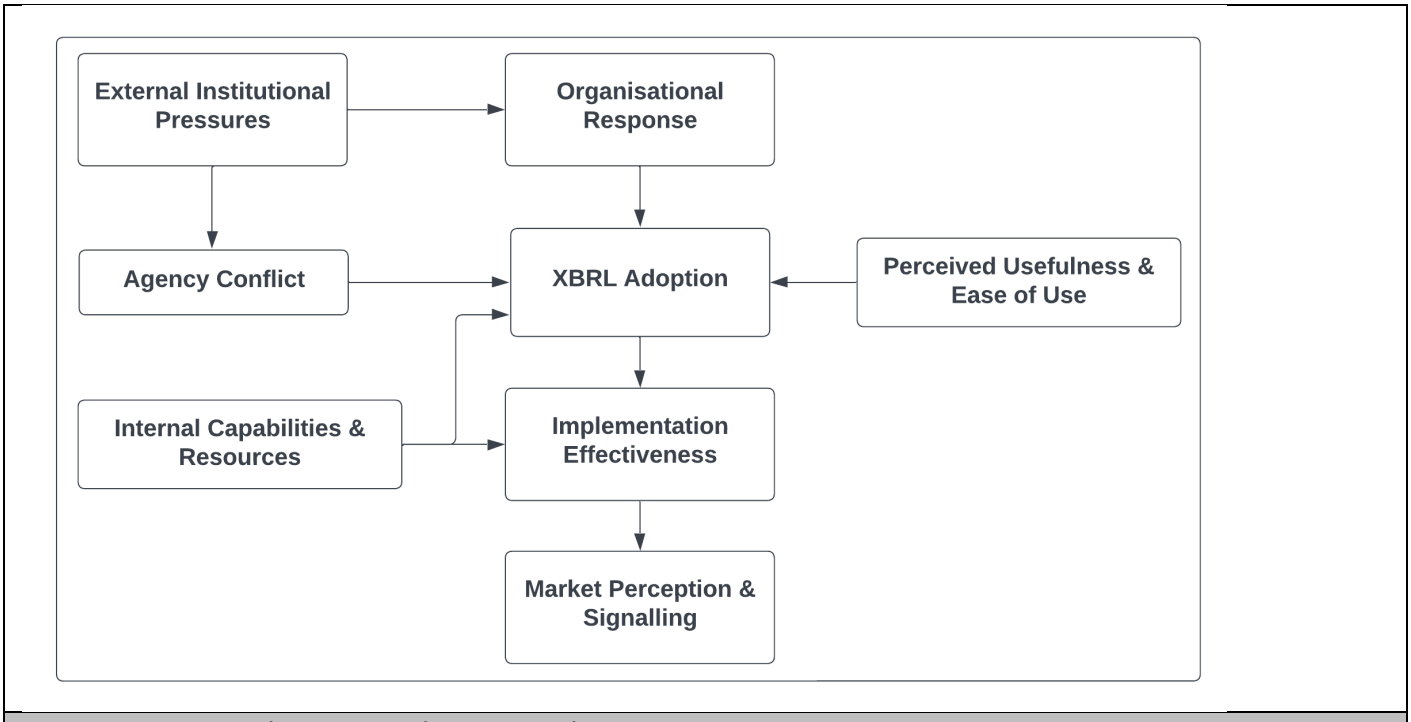

Figure 3: Integrated Conceptual Framework.

Discussion of Prior Studies on XBRL

This section synthesizes insights from prior literature to provide a deeper understanding of the evolution, challenges, and contextual factors surrounding XBRL adoption and implementation.

Technological Advancement and Implementation of XBRL

Conceptual studies on XBRL offer valuable insights into its developmental trajectory, highlighting the interplay between technological design and institutional context (Locke & Lowe, 2007; Williams et al., 2006). For instance, there has been emphasize on how digital infrastructures reduce administrative burdens while requiring active engagement from institutional actors (Troshani et al., 2018). Suta and Tóth (2020) supported this view by illustrating the automation benefits of XBRL in industry analysis, but also warns about metadata inconsistencies. Other studies underscored the translation challenges in digital reporting, pointing to shifts in accounting practices due to the adoption of machine-readable formats (Locke et al., 2018). These studies collectively highlight that XBRL's promise is contingent not just on technological capability but on governance structures, actor engagement, and sociotechnical alignment. A key factor in successful XBRL adoption is the design and adaptability of its taxonomy. Troshani et al. (2019) highlights its transformative role in standard-setting, while La Torre et al. (2018) showed how bi-dimensional taxonomies support dynamic, integrated reporting. In response to COVID-related disclosure needs, there should be a risk-focused taxonomy for 10-K filings and there is a need for taxonomy literacy in assurance, advocating for improved education (Alles, 2021; Debreceny et al., 2020).

XBRL implementation is the widely examined topic in the literature, with studies highlighting its complexity across organizational and regulatory contexts. It has been suggested that the successful adoption depends on institutional alignment and the coordination of technical and social systems (Troshani et al., 2015; Troshani & Lymer, 2010). In the U.S., Pei and Vasarhelyi (2020) proposed U-XBRL to enhance reporting relevance through user-driven, customizable formats. In developing countries, however, there was a lack XBRL adoption despite widespread internet reporting due to regulatory overlap, firm readiness, and limited enforcement as key barriers (Amalia et al., 2024; Saeid Homayoun, 2011). For instance, Malaysian studies (e.g., Ilias et al., 2021; Uyob et al., 2023) highlighted the importance of perceived ease of use, management support, and incentives. Chen (2012) adds that program alignment and incremental implementation are vital for public sector success. Broader adoption is also influenced by stakeholder engagement and organizational dynamics, where the awareness of the preparers is found to be limited (Dunne et al., 2013), and smaller firms may face compliance burdens, often leading to poor-quality XBRL extensions (Zvekan, 2025). Hence, XBRL implementation is not uniform. It is influenced by national governance, organizational maturity, institutional alignment, and even firm size. Tailored approaches are essential for adoption success. In terms of information acquisition, there is a significant rise in systematic downloads of financial statements via EDGAR following XBRL implementation (Chen & Zhou, 2019) as it reduced information-processing costs (J. B. Kim, Li, et al., 2019).

It should be noted that XBRL's future is increasingly tied to digital transformation through AI and FinTech integration. The collaborative development of an XBRL-enabled financial supply chain, and these technologies reduce errors, fraud, and costs, while improve reliability

and efficiency in financial reporting (Fahy et al., 2009; Mosteanu & Faccia, 2020). Moving forward, research should explore XBRL's convergence with technologies like AI, smart tagging, and blockchain to support predictive analytics and automated assurance systems.

Adoption Drivers and Barriers

Research on XBRL adoption highlights both its perceived benefits and the persistent barriers to implementation. Pinsker and Li (2008) provided early evidence that XBRL enhances transparency and investor communication, with adoption costs often overestimated. However, Steenkamp and Nel (2012) found that in contexts like South Africa, non-mandatory status and limited perceived benefits have constrained uptake, suggesting that strategic value alone is insufficient without strong incentives.

At the macro level, Borgi and Tawiah (2022) and Sassi et al. (2024) emphasized that institutional and environmental conditions (such as regulatory pressure, technological capacity, and investor protection) are crucial to national adoption patterns, especially in developing countries. Conversely, Singh and Singh (2022) identified organizational and training deficiencies as key inhibitors in India, reflecting broader disparities in global adoption readiness. However, awareness and education remain foundational, where low XBRL awareness among preparers is limited to outdated digital formats (Helfaya & Amin, 2020; Wulandari & Ali, 2019). Hence, there is a need for broader training and policy support.

Given that adoption has been voluntary in some markets, studies further showed how firm-level and management characteristics shape engagement (Boritz et al., 2018; Brands et al., 2022; Martinis et al., 2020). Hoitash et al. (2021) demonstrate that analyst expertise helps mitigate complexity in financial reporting, reinforcing the value of human capital. In the UK, Alkhatib et al. (2019) show that technological competence and management support drive small firms' digital reporting adoption. Meanwhile, Ulupui et al. (2023) find that in Indonesia, firm size promotes adoption, but profitability and reliance on simple internet reporting discourage it. It is worth noting that XBRL adoption is driven by a combination of institutional forces, managerial capabilities, and perceived technological value, but hindered by educational gaps, complexity, and weak regulatory mandates, particularly in emerging economies.

XBRL's adoption reflects more than just a technological upgrade and it signifies a paradigm shift in how organizations manage, present, and leverage financial data. Yet, this shift is obstructed when institutional readiness is low, regulatory enforcement is weak, or preparers lack digital fluency. As seen in countries like India or Indonesia, organizational inertia and digital illiteracy remain real threats to effective implementation, even when strategic benefits are recognized. Furthermore, micro-level enablers, such as managerial support, firm size, and analyst expertise, are essential but insufficient on their own without a conducive macro-environment. Thus, I argue that XBRL adoption must be treated as a multi-dimensional challenge, requiring harmonized efforts from regulators, firms, educators, and investors.

XBRL's Impact and Organizational Outcomes

XBRL is often credited for enhancing financial transparency and limiting managerial opportunism. Empirical evidence supports this view (e.g., Kim, et al., 2019; Zhang & Shan,

2025) showed that standardized XBRL and iXBRL improve earnings quality and market predictability, respectively. However, such benefits are not universal. However, not all outcomes are uniformly positive. Huang et al. (2019) and Chen et al. (2021) highlighted how firms, particularly in regulated contexts, use XBRL extensions to obscure performance and increase real earnings management. Hsieh et al. (2019a) further noted that while XBRL improves disclosure efficiency, it also prompts a shift from accrual-based to real-activity-based manipulation.

Investment-related research also paints a nuanced picture. Palas and Baranes (2019) confirmed the forecasting utility of XBRL data despite concerns over data consistency. Likewise, Arora and Chauhan (2023) maintained that improved readability via XBRL infrastructure attracts foreign investors by reducing information asymmetry. At the firm level, there is a link XBRL adoption to stronger alignment between executive pay and firm performance, especially in non-SOEs and well-governed firms (Qi et al., 2018; Wang et al., 2014). Yet, Ulupui et al. (2022) found no significant effect on value relevance in Indonesia, suggesting that institutional context plays a decisive role. This implies that adoption must be supported by institutional quality, investor education, and regulatory enforcement to produce tangible capital market effects.

Other studies position XBRL within the broader sustainability and ESG discourse. Alkayed et al. (2023) and Faccia et al. (2021) emphasize XBRL's potential in sustainability reporting. While the former demonstrated transparency gains in Jordan, the latter propose integrating ESG metrics into XBRL taxonomies for standardized disclosure. By aligning financial and sustainability disclosures, their framework encourages mandatory, standardized ESG reporting, bridging the gap between traditional financial metrics and emerging non-financial indicators.

The literature on XBRL's impact on analyst behavior and investment efficiency presents a nuanced picture. While early implementation in China reduced forecast accuracy due to poor data quality (Liu, Yao, et al., 2014), later U.S. studies (Lambert et al., 2019; Liu, Wang, et al., 2014) observed gains in analyst coverage and forecast timeliness, though accuracy improvements were limited. The role of XBRL extensions is particularly critical in which certain extensions, especially footnote tags, enhance analyst forecasts (Johnston, 2020; Li & Nwaeze, 2018). However, Jiang et al. (2024) caution that post-data breach complexity increases may obscure transparency, signaling the risk of strategic misuse.

Beyond analysts, XBRL appears to reduce crash risk in high-opacity firms (Zhang et al., 2019) and improve investment efficiency. Standardized tags streamline processing and aid resource allocation (Feng & Kim, 2022), particularly in weakly governed firms (Cheng et al., 2021) and those with limited external monitoring. XBRL also broadens investor bases by reducing local bias (Li et al., 2020). Yet, Locke et al. (2015) found no significant improvement in decisions by retail investors, suggesting that the benefits are more pronounced for sophisticated users.

The impact of XBRL on loan and capital costs also varies across contexts. In developed markets, it was reported that XBRL adopters secure better loan terms due to reduced information asymmetry, especially when using standardized tags (Chen et al., 2018; Kaya &

Pronobis, 2016). However, Liu et al. (2014) and Tian et al. (2025) revealed that in China, early or excessive adoption, particularly with many extensions, raised capital costs due to reduced comparability. From a contracting perspective, Dalci et al. (2025) suggested that XBRL may substitute for debt monitoring by weakening the conservatism-leverage link, while Bulyga et al. (2020) noted enhanced credit institution transparency. Regarding tax behavior, the evidence is mixed, due to complex interplay of regulatory readiness, taxonomy quality, organizational capacity, and strategic behavior. Some studies reported that XBRL enhances tax compliance by reducing IRS monitoring costs and improving accrual precision (J. Z. Chen et al., 2021; Walton et al., 2021). In contrast, Saragih and Ali (2023) found limited deterrence effects in Indonesia, suggesting that strong governance and well-developed taxonomies are essential for digital reporting to curtail avoidance.

While XBRL holds substantial promise as a digital reporting standard that enhances transparency, accountability, and information efficiency, its success is highly contingent on contextual enablers such as regulatory oversight, institutional quality, standardization practices, and user sophistication. The evidence reveals a dual-edged nature: on one hand, when implemented with rigor and supported by strong governance, XBRL facilitates improved earnings quality, investment efficiency, and access to financing. On the other hand, its flexibility, particularly through customizable tag extensions, can be strategically exploited, leading to opacity rather than clarity. Moreover, XBRL's evolving role in ESG and sustainability reporting represents a critical frontier. It offers a practical path toward harmonized, comparable, and mandatory non-financial disclosures, but this potential remains underdeveloped and requires coordinated efforts among policymakers, standard setters, and firms.

Financial Reporting Quality and Comparability

The general consensus is that XBRL can improve reporting quality, particularly when supported by strong governance and institutional capacity. Tawiah and Borgi (2022) reported significant global improvements, especially in developing countries. Similarly, more studies (e.g., Ashoka et al., 2020; Guo et al., 2022) reported a positive effect on audit quality and internal controls. Conversely, other research reported detrimental effect of XBRL (Kim & Lee, 2025; Sanad, 2024). For example, Sanad (2024) reported that in the UAE, XBRL adoption correlates with increased misclassification of income statement items, raising concerns about digital opportunism and suggesting a need for better regulatory alignment. Such concern can be addressed by ERP integration with XBRL boosts quality by reducing errors and increasing comparability, reaffirming the importance of digital ecosystem alignment (Guo et al., 2022). XBRL has a generally positive but uneven impact on reporting timeliness. While firms with good governance and experienced auditors benefit from shorter filing lags, complex filings and internal control weaknesses still pose delays (Howard & Zhou, 2021; Hwang et al., 2021). There is, however, a concern over the one-size-fits-all assumption, noting that while large firms benefit, smaller ones may experience increased lag (Zhou, 2020).

Evidence is mixed regarding XBRL's ability to enhance information comparability. While studies (e.g. Al-Okaily et al., 2024; Cahan et al., 2022) showed improvements in financial statement readability and transparency (especially in Jordanian firms with supportive IT infrastructure). This inconsistency reflects the tension between the promise of standardization and the realities of flexible implementation. While XBRL can enhance

information comparability, these gains depend on tagging discipline, institutional support, IT capability, and maturity of adoption. Dhole et al. (2015) highlighted initial declines in comparability, particularly when firms overuse customized extensions. Shan and Troshani (2021) added that institutional differences (e.g., between the U.S. and Japan) moderate the value relevance of XBRL adoption, emphasizing the need for context-sensitive implementation strategies.

These findings underscore that XBRL is not a universally effective tool, it is highly context-dependent. When aligned with strong governance, technological capacity, and regulatory enforcement, XBRL can significantly enhance reporting transparency, reduce information asymmetry, and improve both timeliness and quality. However, its potential is undermined in environments with weak controls, poor taxonomy design, and inadequate user training.

Capital Market Effects

The impact of XBRL on stock market behavior has attracted considerable scholarly attention, particularly concerning its role in improving informational efficiency and reducing information asymmetry. Studies provided empirical evidence that XBRL, especially in the form of Inline XBRL (iXBRL), significantly enhances the transparency of financial disclosures, leading to lower asymmetry and improved access to information for investors (Luo et al., 2023; Yoon et al., 2011). These benefits are especially pronounced for large firms with substantial investor followings, while small firms appear to benefit less, possibly due to limited user capabilities or inconsistent tagging practices. In a European context, Liu et al. (2017) similarly found that XBRL adoption increased market liquidity and transparency, although outcomes varied by firm size and technological sophistication. Market reaction studies present a more nuanced view. While legislative milestones surrounding XBRL have been met with positive stock market responses (G. Chen, Sara Wang, et al., 2018), early evidence also suggests temporary adverse effects on trading behavior. Blankespoor et al. (2014) reported increased bid-ask spreads, reduced liquidity, and lower trading volume, particularly among small trades, immediately following mandatory adoption in the U.S. These findings were echoed in emerging markets; for instance, Mansour et al. (2025) found that in Jordan, XBRL adoption led to wider spreads and reduced trading volumes, indicating increased investor uncertainty. Nonetheless, Humeedat (2024) observed post-adoption improvements in stock index performance, although these were not accompanied by a significant increase in foreign investment flows.

The structure and implementation of XBRL tagging significantly influence capital market outcomes. Studies consistently show that standardized tags enhance disclosure quality and market informativeness, while excessive reliance on custom extensions can increase complexity and reduce comparability (Cormier et al., 2019; Lim et al., 2023). Cho et al. (2025) further argued that XBRL modifies the feedback loop between stock prices and managerial decision-making, especially in complex firms, by limiting managers' ability to learn from market signals.

The mode of adoption, voluntary versus mandatory, also shapes investor perception. Voluntary adopters, especially those with strong governance, demonstrate higher information value (Cormier et al., 2019; Efendi et al., 2016), whereas mandatory adoption

may yield inconsistent results without adequate regulatory support (Dong et al., 2016; Sassi et al., 2020). In such cases, compliance challenges can undermine the transparency XBRL is meant to promote.

The adoption of XBRL holds significant promise for enhancing capital market transparency, efficiency, and information symmetry. However, the realized benefits are not automatic and depend heavily on how the system is implemented and used. We believe that standardization of tags, institutional readiness, and stakeholder education are critical enablers of XBRL's effectiveness. When firms adhere to standardized taxonomies and regulators ensure consistent enforcement, XBRL can reduce information asymmetry, enhance stock market reactions, and empower both institutional and small investors. Nonetheless, we also contend that these gains are neither universal nor uniform. The presence of custom tags, weak enforcement, and limited user capability, particularly in emerging markets or among retail investors, can reduce or even reverse the intended outcomes. Hence, XBRL should not be treated as a one-size-fits-all solution. Instead, its success requires a context-sensitive approach, including regulatory support, firm-level digital readiness, and continuous education. We advocate for further cross-country and longitudinal research to better understand the institutional and behavioral dynamics shaping the post-adoption effects of XBRL. Only through such a holistic and targeted strategy can policymakers unlock the full potential of this digital reporting tool.

Assurance and Auditing Considerations

Recent research highlights the multifaceted benefits of XBRL in auditing and assurance contexts. It has been found that XBRL enhances audit efficiency by reducing costs and improving transparency. For example, studies (i.e., Amin et al., 2018; Shan & Troshani, 2014) found that XBRL adoption shortens audit report lags and lowers audit fees, particularly for large firms. This is attributed to the improved clarity and structure of data, which facilitates external audit procedures. Furthermore, XBRL plays a crucial role in strengthening internal audit functions and corporate governance. Abdolmohammadi et al. (2017) observed that internal audit involvement in XBRL implementation is positively associated with larger firms, robust governance systems, and stronger legal infrastructures. Similarly, Alles and Piechocki (2012) emphasized XBRL's potential in improving governance decision-making by providing better-tagged and timely financial data.

However, challenges remain. Debreceny et al. (2010) reported significant errors in early SEC filings, raising concerns about data quality and the need for audit assurance frameworks tailored to XBRL (Cohen et al., 2014). To address this, Gambetta et al. (2016) and Guo et al. (2022) proposed integrating XBRL with ERP systems and continuous auditing models to improve compliance and oversight. From a methodological standpoint, Hoitash and Hoitash (2018) introduced an Accounting Reporting Complexity (ARC) measure using XBRL tags, which correlates with higher audit fees and reporting delays. In parallel, Yang et al. (2019) employed graph mining techniques on XBRL data to detect reporting inconsistencies and industry-specific fraud risks.

We believe that XBRL adoption presents a promising opportunity to modernize and enhance audit and assurance practices. The evidence clearly shows that XBRL can improve audit efficiency, reduce costs, and increase transparency, especially when supported by

robust governance systems and regulatory oversight. However, these benefits are not straightforward. Early implementation challenges, such as data quality issues and inconsistent tagging practices, highlight the importance of proper standardization and training. We also support the integration of XBRL into internal audit frameworks and ERP systems, which could further enhance real-time monitoring and compliance. Moreover, the development of advanced audit tools like the ARC measure and graph mining approaches offer valuable pathways for detecting reporting irregularities and improving financial integrity.

Recommendations for Future Research

The existing literature on XBRL, while extensive (see Figure 4), reveals several significant gaps that need to be addressed to advance the understanding and application of this reporting technology. These gaps highlight areas where further research is necessary to fully realize the potential benefits of XBRL in enhancing financial transparency, reporting efficiency, and stakeholder engagement.

One concern is the variability in outcomes across firm size and institutional contexts. Although XBRL adoption has been shown to reduce filing lag and increase reporting efficiency in larger firms (Amin et al., 2018), smaller firms often face increased compliance burdens and reporting delays, challenging the effectiveness of a uniform XBRL mandate (Zhou, 2020). These findings underscore the limitations of a one-size-fits-all approach and call for regulatory flexibility tailored to organizational capacity.

The role of contextual factors, particularly legal origin, market maturity, and enforcement strength, remains underexplored. Evidence suggests that XBRL adoption improves financial reporting quality more substantially in developing countries compared to developed ones (Tawiah & Borgi, 2022), and has a more pronounced impact on stock liquidity in civil law jurisdictions than in common law systems (Sassi et al., 2021). Yet, there is insufficient theorization around why these differences emerge, or how institutional adaptations could mitigate uneven outcomes. Future research should adopt multi-level, cross-country designs to unpack these institutional effects and explore long-term adoption trajectories.

Moreover, the integration of XBRL with emerging technologies (such as AI, blockchain, and automated assurance tools) remains in its infancy. Although there is conceptual support for machine learning-driven tagging and blockchain-secured data integrity (Mosteanu & Faccia, 2020), empirical work in this area is limited. These innovations hold potential to enhance reporting automation, reduce tagging errors, and enable real-time auditing. However, these benefits will remain aspirational unless grounded in rigorous, use-case-based evaluations.

Another underdeveloped area is the human interface with XBRL systems. Studies such as those by Guo and Yu (2022) and Singh & Singh (2022) reveal that many users, particularly retail investors and SMEs, either lack the tools or the capacity to meaningfully engage with XBRL data. Similarly, usability challenges in XBRL software, limited technical training, and the complexity of extensions undermine adoption. Greater attention is needed on user-centered design, training efficacy, and the accessibility of XBRL tools, especially for less sophisticated users and markets.

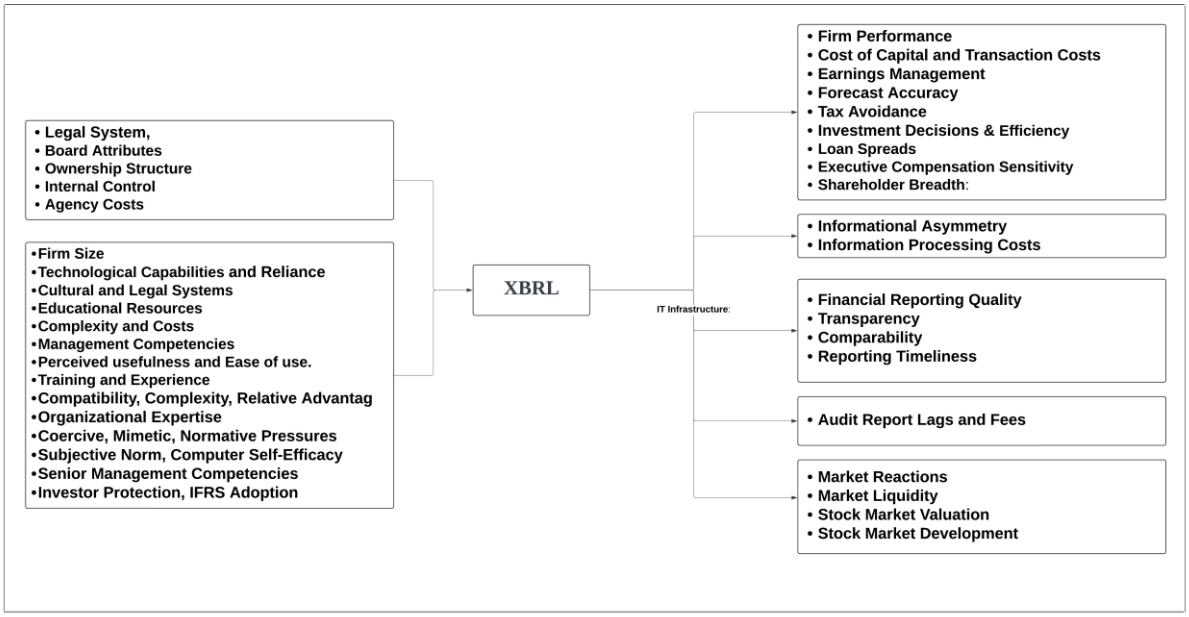

Figure 4: The integrated framework of XBRL adoption.

Lastly, while some studies report that standardized tags improve comparability and reduce information asymmetry (Lim et al., 2023), others caution that excessive or poorly anchored custom extensions degrade data quality and increase processing burdens (Cormier et al., 2022). This suggests that future research should move beyond binary assessments of "adoption vs. non-adoption" and instead focus on the quality and discipline of implementation. The emerging focus on XBRL-ESG integration and automated assurance systems presents a fertile area for thematic innovation, even as overall publication volume begins to increase.

Conclusion

This systematic literature review provides a comprehensive analysis of the adoption and impact of XBRL in the context of modern financial reporting. The findings underscore the transformative potential of XBRL in enhancing transparency, improving market efficiency, and reduce audit reporting lag. However, the review also highlights several challenges and inconsistent outcomes, particularly regarding the increased complexity of financial reporting, the heightened costs for smaller firms, and the variable effects on analyst forecast accuracy.

From a practical perspective, the implications of this review are significant for regulators, firms, and practitioners. Regulatory authorities should adopt a phased and proportionate approach to XBRL mandates, recognizing the differential readiness across firm sizes and sectors. Smaller firms often face higher compliance burdens; thus, subsidized training programs, sandbox environments, and simplified taxonomies can be introduced to ease adoption. Additionally, mandatory consultation with preparers, auditors, and industry associations should precede major technical updates to ensure regulatory relevance and practicality. Regulators could also consider establishing help desks or regional support centers, particularly in emerging markets where digital infrastructure remains underdeveloped. Companies must approach XBRL not merely as a compliance exercise, but

as an opportunity to streamline internal reporting processes, strengthen governance, and enhance investor communication. Large firms should invest in integrating XBRL modules into ERP systems to reduce redundancy and improve data accuracy, while smaller firms could collaborate with trusted third-party service providers to minimize the costs and risks of implementation. Importantly, firms should designate XBRL champions or digital reporting officers who are responsible for internal coordination, error resolution, and continuous learning as the taxonomy evolves. Furthermore, software developers and XBRL consultants play a key role in shaping reporting quality. They should focus on user-friendly tagging interfaces, automated error detection, and customizable reporting templates that align with both national and international taxonomy standards. Practitioners, particularly accountants and auditors, must develop XBRL-specific competencies through professional development programs and collaborate proactively with regulators to interpret emerging tagging requirements, especially for ESG-related disclosures.

The theoretical implications of this review are equally important. The study reinforces the need for a multi-theoretical approach to understanding XBRL adoption, considering the complex interplay of technological, organizational, and institutional factors. The inconsistent findings related to the outcomes of XBRL adoption suggest that existing theories, such as the Diffusion of Innovation Theory and Institutional Theory, may need to be adapted or extended to fully capture the nuances of XBRL implementation. Future research should focus on developing more integrated theoretical frameworks that can account for the diverse determinants and outcomes associated with XBRL adoption across different contexts.

While this study adopts a rigorous systematic literature review protocol, we acknowledge certain limitations that may introduce bias. First, the review is restricted to articles indexed in the WOS and published in English. This decision was driven by WOS's coverage of high-impact and peer-reviewed journals across accounting, finance, and information systems, ensuring the inclusion of influential and high-quality research. However, this focus inherently excludes potentially valuable regional studies published in other databases or in non-English languages, which could offer additional cultural or institutional insights, particularly from developing economies. Future reviews could extend the scope to include Scopus, Google Scholar, or regional databases to address this limitation.

Declarations

Competing interest: This work is original and not submitted elsewhere. And the authors declare no conflict of interest. The views, interpretations, and conclusions expressed in the paper are solely those of the authors and are not associated with the publisher.

Data availability statement: Data will be made available by the corresponding author upon reasonable request.

Conflict of interest: the authors declare that they have no conflict of interest.

Authors' Contribution

Maha Alzeer: Writing, illustration, software validation, editing---original draft, review, and finalization.

Suresh Ramakrishnan: Writing, illustration, software validation, editing---original draft, review, and finalization.
Hanini Ilyana Che Hashim: Writing, illustration, software validation, editing---original draft, review, and finalization.

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