DO FINANCIAL STATEMENTS STILL MATTER IN THE TECH ERA? A SYSTEMATIC LITERATURE REVIEW ON THE USEFULNESS OF ACCOUNTING INFORMATION IN HIGH VOLATILITY FIRMS

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Abstract

This study examines the evolution and relevance of accounting information in supporting decision-making within technology sector firms characterized by high market volatility over the past decade. Adopting a systematic literature review (SLR) approach combined with bibliometric analysis, the study identifies key indicators discussed in the literature, including traditional GAAP-based measures and non-financial metrics such as digital disclosures and intangible assets. The findings indicate that while traditional financial statements remain foundational, growing challenges arise from rapid market dynamics and global economic uncertainty, thereby driving the incorporation of non-financial data and digital technologies to enhance information relevance. These insights provide strategic implications for academics, practitioners, and policymakers in enriching the use of accounting information to support more accurate and adaptive decision-making in the digital era and volatile markets.

Keywords: Usefulness of Accounting Information, Financial Information, Market Volatility, Systematic Literature Review

INTRODUCTION

In recent decades, the rise of digital technology has brought fundamental changes to various aspects of business and organizational decision-making, including the role of accounting information. The relevance of traditional accounting information once regarded as the primary benchmark for corporate performance and value has increasingly been questioned due to technological disruptions and fluctuating market dynamics. Companies operating under high levels of volatility face growing pressure to rely more on non-financial data and real time market indicators, raising questions about the extent to which accounting information remains useful as a basis for decision making (Barth et al., 2023; Tyll & Pohl, 2014). This shift is driven not only by technological advancements but also by the rising complexity of risks and uncertainties that characterize modern business in the digital era (Dokuchaev, 2020; Makhanya, 2024).

The use of accounting information reflects a major shift in financial literature, indicating that the role of financial statements as the primary source of information for investors has become increasingly contested. Several studies suggest that technological advancement, innovation, and market-based information have emerged as key factors that often surpass traditional accounting data in importance (Christensen et al., 2016). Indicators such as intangible assets, market sentiment, and technology-driven big data are now employed to complement or even replace accounting information in assessing corporate performance and prospects (Jeny & Moldovan, 2021; Leuz & Wysocki, 2016). The use of such alternative data not only enhances analytical accuracy but also broadens the scope of evaluation, reducing dependence on financial statements and ultimately influencing the quality of investment decisions (Imhanzenobe, 2022; Lev, 2018).

This context raises a key question of whether accounting information can still maintain its relevance, particularly for companies with high levels of volatility. Several studies indicate that earnings and cash flows often lose their predictive power for stock returns in highly dynamic technology sectors (Abubakar, 2015; Chen et al., 2015; Gharbi et al., 2013; Khaldi & Hamama, 2024). Conversely, investors increasingly rely on non-financial indicators such as product innovation, customer data, and digital strategies when making economic decisions (Migliavacca, 2024). Therefore, accounting information is no longer viewed merely as a historical record but faces the challenge of remaining relevant as a predictive instrument to support the governance of modern corporations (Drake et al., 2015; Kousenidis et al., 2014).

The literature emphasizes that although the relevance of accounting information has declined, financial statements continue to play a crucial role as instruments of accountability and contracting. Several studies indicate that accounting measures are still utilized in debt covenants, compensation contracts, and governance mechanisms, even though their contribution to explaining market prices has become increasingly limited (Dunham & Grandstaff, 2022; Shivakumar, 2013). Changes in capital market structures, the growing dominance of intangible assets, and resistance from some stakeholders toward non-financial indicators have also influenced the patterns of accounting information usage. Moreover, a deeper understanding of how the characteristics of high-risk firms affect the relative usefulness of accounting data has become increasingly necessary (Cieslak, 2024; Smith & Cordina, 2014; Tudor & Achim, 2019). Therefore, a comprehensive examination of the role

of accounting information in the digital era is essential to assess its degree of relevance in high risk companies.

The growing academic attention to the relevance of accounting information has produced a wide range of literature discussing its predictive value, relationship with stock returns, and contractual implications. However, the diversity and fragmentation of these studies highlight the need for a systematic review capable of integrating and synthesizing the findings comprehensively. The Systematic Literature Review (SLR) approach is deemed appropriate, as it enables the structured and transparent identification, evaluation, and synthesis of relevant research results (Page et al., 2021). Through the SLR approach, this study seeks to provide a comprehensive understanding of the usefulness of accounting information in high-risk firms, with an emphasis on value relevance, complementary indicators, and their influence on decision-making practices.

Despite significant developments in the literature on accounting information, studies that specifically examine its role in companies with high levels of volatility remain relatively limited. Cieslak (2024) emphasizes that although numerous studies have explored the value relevance of financial statements, research that systematically reviews their usefulness in highly dynamic sectors remains fragmented and has yet to produce a comprehensive conceptual framework. This condition indicates a research gap that needs to be bridged through a systematic literature review to identify the factors, methodologies, and implications associated with the use of accounting information in high risk firms.

This study aims to explore and synthesize the latest developments in the literature discussing the usefulness of accounting information in high-risk companies. To achieve this objective, a systematic literature review approach is employed, enriched with bibliometric analysis and an in-depth examination of relevant scholarly publications in the field. This method enables the identification of key trends, dominant indicators used, and existing research gaps. Accordingly, the study not only presents a historical and conceptual mapping of accounting information relevance but also provides strategic directions for future research to strengthen the theoretical foundation and foster a more consistent scholarly tradition.

The structure of this article is organized systematically to provide a comprehensive overview of the usefulness of accounting information in high risk companies. Section 2 presents an in-depth literature review related to the concept of accounting information relevance and the debates emerging in the digital era. Section 3 outlines the methodology, in which the SLR process combined with bibliometric techniques is conducted based on the guidelines of Wahono (2016), Maditati et al. (2018), and Tranfield et al. (2003). This includes the formulation of research questions using the PICOC framework, literature search strategies, inclusion and exclusion criteria, and methodological validation procedures. Section 4 presents the results of the systematic literature analysis, utilizing VOSviewer for visual mapping and Excel for data processing, while critically examining the implications of the findings for theoretical and practical developments in accounting under high volatility. Section 5 concludes the article with key insights and recommendations for future research directions to strengthen the scientific foundation regarding the usefulness of accounting information in the digital era.

REVIEW OF LITERATURE

Usefulness of Accounting Information and the Shift in Reporting Practices

Permanent changes in the business environment have increased volatility and the need for relevant and timely accounting information to support decision-making. Consequently, organizations must adopt contemporary reporting practices that provide comprehensive, accurate, and forward-looking information to assess performance and intangible assets, thereby enabling faster and more optimal investment decisions (Al-Mawali & Am, 2016; Baines & Langfield Smith, 2003; Oyewo, 2021). In today's technological era, decision-makers are increasingly reliant on real-time accounting and non accounting information to reduce uncertainty and assess business risks (Al-Hattami, 2022; Lutfi et al., 2020).

Permanent changes in the business environment have heightened volatility and increased the demand for relevant and timely accounting information to support decision-making. Therefore, organizations need to adopt contemporary reporting practices that provide comprehensive, accurate, and forward-looking information to evaluate performance and intangible assets, thereby facilitating faster and more optimal investment decisions (Al-Mawali & Am, 2016; Baines & Langfield-Smith, 2003; Oyewo, 2021). In today's technological era, decision-makers are increasingly dependent on real-time accounting and non-accounting information to reduce uncertainty and assess business risks (Al-Hattami, 2022; Lutfi et al., 2020).

The Alignment of Accounting Information with Value Relevance

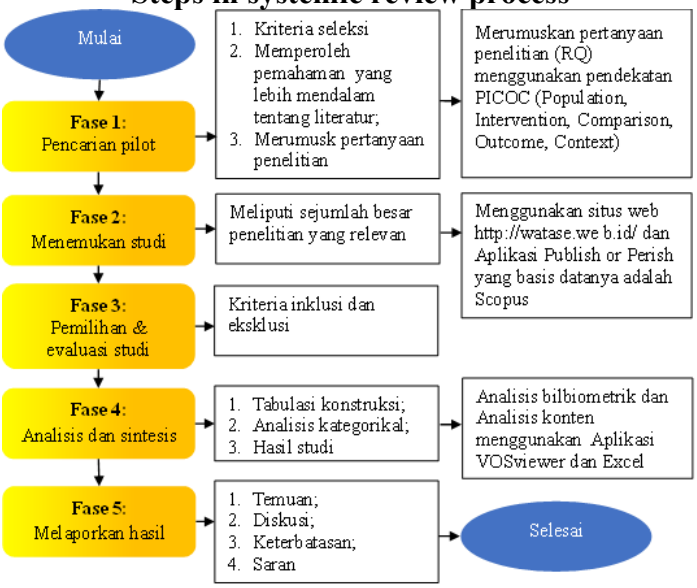
Several contingency factors (both external and internal to the organization, such as market volatility, technology, capital structure, business strategy, organizational culture, and national regulations) affect reporting practices (Abdel-Kader & Luther, 2008; Baines & Langfield-Smith, 2003; Boukr et al., 2021; Chenhall, 2003; Chenhall & Morris, 1986; Mia & Clarke, 1999; Oyewo, 2022). Indeed, there is a need to adapt the implementation and use of reporting practices to provide decision-makers with the information necessary for valuation, monitoring, and decision making processes. Organizations must implement and utilize contemporary reporting practices to cope with increasing market volatility, which influences information needs, capital structure, strategies, and operations; and, in turn, value relevance (Afifa & Saleh, 2022). The implementation and use of reporting practices should be context dependent to mitigate risks and enhance competitive advantage as well as information relevance (Afifa & Saleh, 2022; Dahal, 2022).

In this context, and following contingency theory, there is no single ideal or universal set of reporting practices suitable for all organizations and circumstances (Afifa & Saleh, 2022; Otley, 2016; Oyewo, 2022; Reid & Smith, 2000; Umanath, 2003). However, whenever the implementation and use of reporting practices are aligned with contingency factors such as volatility, investor satisfaction with the accounting information provided tends to increase (Chenhall, 2003; Fry & Smith, 1987; Haldma & Lääts, 2002; Nicolaou, 2000; Tillema, 2005). As investor satisfaction with accounting information improves, the effectiveness of investment decision-making also rises, helping organizations enhance their chances of survival and success (Al-Hattami, 2022). Reporting practices that provide the necessary information can lead to greater stakeholder satisfaction with accounting information, which in turn positively influences organizational operations and overall performance (Lutfi et al., 2020).

RESEARCH METHOD

The Systematic Literature Review (SLR) method was selected to identify, evaluate, and interpret all relevant research evidence within the context of the usefulness of accounting information. SLR is a structured review approach that is widely recognized across various disciplines, including financial accounting and capital market research (Tranfield et al., 2003). The use of this method aims to enable researchers to collect and analyze a large body of literature relevant to the research topic while synthesizing existing research findings. The period from 2016 to 2025 was evaluated during the preparation of this article. The research methodology employed in this study follows the guidelines outlined by Denyer and Tranfield (2009) for conducting the SLR process, which consists of five stages or phases.

Figure 1.
Steps in systemic review process



Source: Processed data (2025)

Search Strategy and Formulating Research Questions

The literature search strategy in this study was systematically designed to obtain relevant, high quality articles aligned with the main topic, the usefulness of accounting information in companies with high volatility. The search process was conducted through several internationally reputable scientific databases, such as Scopus. The selection of this database was based on its broad coverage of academic journals and its ability to provide filtering options based on Quartile categories (Q1–Q3) and year of publication, using two applications, Watase Uake Tools and Publish or Perish Application (Scopus Database)

The initial stage of the search began with the identification of keywords. The search keywords were developed through a brainstorming process based on key terminologies commonly used in the literature on accounting value relevance and modern market dynamics. The main keywords used included: “value relevance,” “financial information,” “earnings,” “cash flow,” “intangible assets,” “market volatility,” and “non-financial indicators.” These keyword combinations were refined using Boolean operators such as AND, OR, and NOT to filter articles more specifically. For example, searches were conducted using phrases such as: ("value relevance" OR "usefulness of accounting") AND ("volatile firms" OR "tech era").

The search period was limited to 2016–2025 to ensure the topic's relevance and timeliness. The entire process followed the guidelines of Wahono (2016) and Tranfield et al. (2003) to maintain the validity and systematic rigor of the literature review.

The PICOC approach (Population, Intervention, Comparison, Outcome, Context) was used to design and structure the systematic review to ensure it is more organized and relevant to the study titled "Do Financial Statements Still Matter in the Tech Era? A Systematic Literature Review on the Usefulness of Accounting Information in High Volatility Firms", as recommended by Wahono (2016). Furthermore, this literature review is guided by the main research questions, which define the focus and scope of the study. The proposed research questions are as follows:

RQ1: What accounting information indicators have been most frequently used in high-volatility technology firms over the past decade?

RQ2: How has the relevance of accounting information evolved in academic literature from 2016 to 2025?

RQ3: What are the main themes and knowledge clusters related to the usefulness of accounting information in high-volatility technology firms based on conceptual structure mapping?

RQ4: In an era dominated by intangible assets and high market volatility, do traditional financial statements still provide useful information for investment decision-making in technology firms, or has their usefulness been significantly replaced by non-accounting metrics?

RQ5: What research gaps regarding the usefulness of accounting information in high-volatility technology firms can offer opportunities for future research development?

To address these research questions, we conducted a Systematic Literature Review to identify the evolution of studies encompassing various approaches to the usefulness of accounting information and the challenges faced in the context of high volatility firms. After identifying the relevant review sample 1.096 articles, we further employed the SLR approach to identify the drivers and outcomes of using financial information for decision-making purposes. The adoption of an SLR with a systematic, transparent, and replicable approach helps minimize researcher bias.

Inclusion and Exclusion Criteria

To ensure a systematic literature selection process, this study establishes the following inclusion and exclusion criteria for the research:

Table 1.
Inclusion and Exclusion Criteria

Category	Inclusion	Exclusion
Topic	Discusses the relevance of accounting information, the usefulness of financial statements, and the role of financial indicators in the technology era for firms with high volatility	Discusses traditional financial issues without linking to high volatility, focuses on public sector accounting topics, or emphasizes regulatory aspects without addressing the usefulness of accounting information
Context	Focus on companies operating in high risk business sectors	Focus on public sector organizations, educational institutions, or non profit

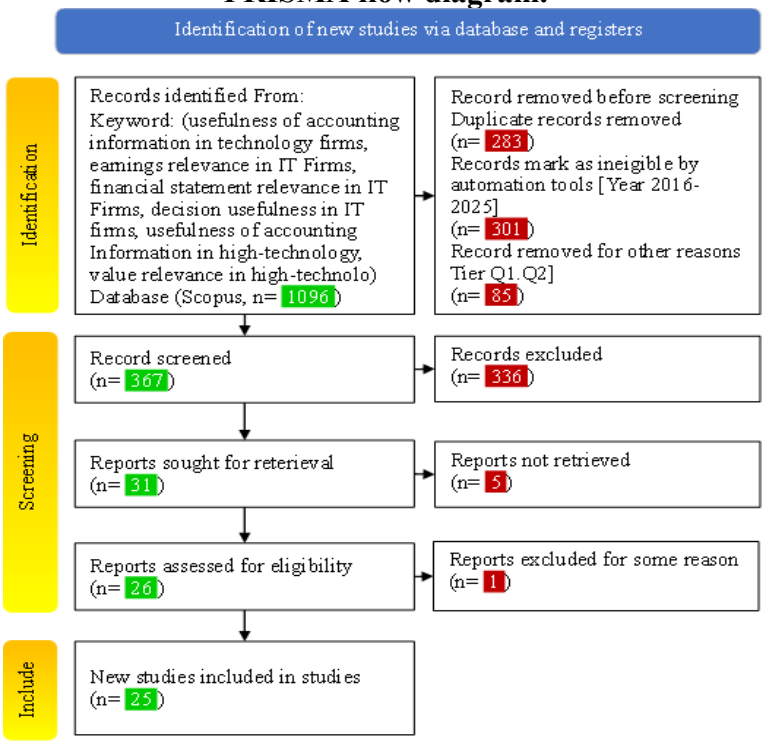
	(technology, finance, startups, and capital markets)	entities that are not affected by market volatility
Type of Document	Peer reviewed journal articles, empirical studies, literature reviews, or case studies	Opinion pieces, editorials, non peer reviewed conference proceedings, theses, dissertations, or non verified practitioner reports
Year	Published between 2016 and 2025	Published before 2016
Language	English	Languages other than English
Indexing and Quality	Indexed in Scopus/Web of Science with a Quartile ranking of Q1–Q3	Not indexed in Scopus Quartile Q4 or categorized as N/A (status unknown)
Document Accessibility	Full text available for download and comprehensive review	Full text not available or only the abstract is accessible

Source: Processed data (2025)

Study Selection and Evaluation

The study selection and evaluation stage is a crucial step in this research to ensure that the literature used is both relevant and of high quality. This study adopts the Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) approach. As stated, the research adheres to the PRISMA guidelines introduced by Moher et al. (2009). PRISMA provides a structured framework for reporting review findings through a flow diagram, as illustrated in Figure 2, which has been widely used in various academic studies to identify and select scientific articles from the Scopus database. In this study, an initial dataset of 1,096 articles published between 2016 and 2025 was retrieved for evaluation.

Figure 2.
PRISMA flow diagram.



Source: Research Analysis (2025)

Analysis and Synthesis

By analyzing 25 selected articles and systematically extracting data, this study develops a comprehensive understanding of the usefulness of accounting information in high-volatility firms within the technological era. Various findings from the literature covering contexts of high-risk business sectors, variations in the utilization of financial data, and methodological approaches were synthesized to identify research trends, challenges related to the relevance of accounting information, and opportunities for integrating emerging technologies in assessing the usefulness of financial reports.

The bibliometric technique employed in this study utilizes three main methods: citation analysis, network analysis, and citation mapping technique. Citation analysis is applied to evaluate the performance of publications, institutions, and authors using metrics such as Total Global Citations (TGC), Total Local Citations (TLC), and Total Local Citations per year (TLC/t). Meanwhile, network analysis is used to map collaboration patterns and the evolution of keywords, while bibliographic coupling is employed to map the intellectual structure of the accounting information relevance literature, as it is most suitable for identifying the current research front. In addition to thematic synthesis, this study incorporates bibliometric analysis using the VOSviewer application to visualize the conceptual structure and intellectual evolution of this topic within the academic literature. VOSviewer was chosen for its ability to provide intuitive visualizations of keyword networks, author collaborations, and inter-document relationships (Maditati et al., 2018).

For the content analysis, Excel was utilized because it allows researchers to maintain full control over data coding and enables deeper meaning extraction through the systematic development of conceptual matrices (Maditati et al., 2018). This matrix includes key elements such as the article title, year of publication, authors, research objectives, accounting variables discussed, and the contribution to understanding the usefulness of accounting information in high risk companies. In addition, a comprehensive review of all articles was conducted to ensure that studies which may be less cited but offer significant insights were still included in the analysis.

Reporting the Findings

The research findings are presented in the form of tables, bibliometric visualizations, and a discussion narrative that follows a systematic approach as outlined by Siddaway et al. (2018). The information presented includes detailed descriptions of the literature search strategy, inclusion and exclusion criteria, study selection process, quality assessment, data extraction, and the stages of synthesizing findings. The results are then formulated into a structured and comprehensive scholarly article, focusing on identifying how accounting information including financial indicators, income statements, and financial ratios remains relevant and influences decision-making in high volatility companies over the past decade.

The report also elaborates on various challenges in maintaining the relevance of accounting information, including fluctuating market dynamics, global economic uncertainty, and the increasingly complex integration of financial technologies. In addition, opportunities to optimize the use of accounting data through digital technologies and its strategic role in enhancing the quality of managerial decision-making are discussed. The final synthesis aims to contribute to the development of literature on the usefulness of accounting information, as well as provide practical insights for managers, investors, and policymakers interested in strengthening the function of financial reporting in the technological era.

RESULTS AND DISCUSSION

Identification of the Most Frequently Used Accounting Information Indicators in Volatile Technology Companies

First, traditional accounting indicators remain the primary foundation for measuring performance and valuing technology firms. Net income continues to be regarded as the key measure of profitability and operational efficiency, as noted by Collins et al. (2019) and Barth et al. (2021). Although earnings in technology companies often fluctuate due to substantial research and development expenditures, net income is still widely used as a basis for estimating market value and stock price responses. In addition, the book value of equity is frequently employed to capture the residual value of a company when revenues have not yet been fully realized, as explained by Easton & Sommers (2018).

Gross margin and operating cash flow are also frequently used to assess a company's capacity to generate cash from its core business operations. As stated by Han & Manry (2020), these indicators are crucial for investors in evaluating an entity's ability to sustain long-term growth amid the high volatility of the technology market. The current ratio and leverage ratio are additionally employed as measures of liquidity and financial stability, although research findings indicate that their significance to market value has relatively declined compared to the pre-digital era (Luo et al., 2022).

Over the past decade, there has been a significant increase in the use of non-accounting indicators (Non-GAAP and digital metrics) as complements to traditional financial information. Customer Acquisition Cost (CAC) and Customer Lifetime Value (LTV) have become important metrics that reflect the efficiency of digital business models in acquiring and retaining customers, as explained by Bradshaw et al. (2020). These two indicators are increasingly acknowledged for better representing the economic reality of technology companies that prioritize user growth over short term profits.

Monthly Active Users (MAU) and Daily Active Users (DAU) are widely used as proxies to measure user engagement and the monetization potential of digital platforms. Li & Zhang (2021) demonstrate that an increase in MAU is positively correlated with stock returns of technology companies, indicating that investors view user activity metrics as forward-looking signals of potential revenue growth.

Burn rate is also an indicator that has received considerable attention, particularly in studies on venture-backed firms and high-risk startups. This indicator measures the speed at which a company consumes its available cash, which indirectly reflects the risk of business sustainability (Sharma & Rao, 2023). Additionally, indicators such as Gross Merchandise Value (GMV) and Average Revenue per User (ARPU) have emerged and are commonly used in the context of e-commerce and platform-based companies. Research by Kim et al. (2022) shows that GMV and ARPU provide incremental information content to stock prices beyond what is contained in traditional financial statements, especially for companies operating within multi-sided digital ecosystems.

Evolution of the Relevance of Accounting Information Over Time (2016–2025)

Publications by Year

Based on the analysis of academic literature from 2016 to 2025, as illustrated in Figure 3, In the early period (2016–2017), the number of publications remained relatively stable, averaging around 23-25 articles per year. The main focus of research during this phase

was the validity of traditional value relevance, such as the relationship between net income and market value of technology-based firms. Studies such as Barth and Israeli (2016) highlighted that although earnings remained an important indicator, their influence on stock prices began to weaken due to investors' increasing reliance on non-accounting indicators.

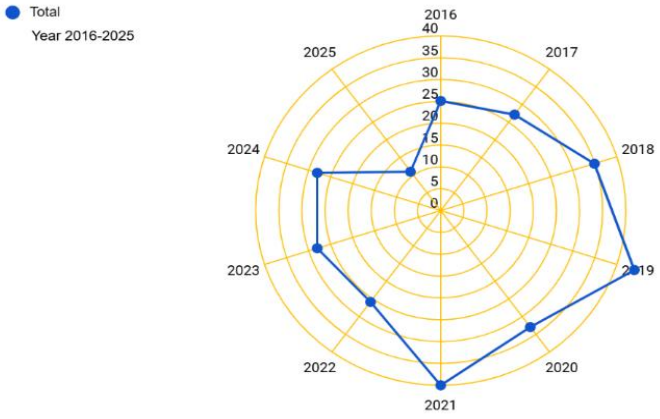
Entering 2018-2019, the number of publications experienced a substantial increase, peaking in 2019 with approximately 35 articles addressing the relevance of accounting information in the context of technology companies. This phase marked a significant paradigm shift: the literature began to introduce the concept of hybrid metrics, which combine traditional accounting data with digital indicators such as Monthly Active Users (MAU), Gross Merchandise Value (GMV), and Customer Acquisition Cost (CAC). Research by Li and Zhang (2019) demonstrated that these non GAAP metrics provide incremental information content to stock prices, exceeding the explanatory power of earnings, book value.

This trend began to decline significantly during the 2020-2021 period, reaching its lowest point in 2021, when the number of publications dropped to only around 10 articles. This decline is largely attributed to a shift in academic focus due to the COVID-19 pandemic, which caused many studies to pivot toward themes such as digital business resilience, risk disclosure, and the pandemic's impact on global capital markets (Sharma & Rao, 2021).

Following this crisis period, the number of publications gradually increased again during 2022-2024, ranging from 15 to 20 articles per year. This reflects the renewed academic interest in the relevance of accounting information, albeit with approaches that are more adaptive to digital phenomena. In this phase, research began to explore the influence of automation, big data, and artificial intelligence (AI) on market value formation and investor perceptions of financial reporting (Kim et al., 2023).

Toward the end of the period, in 2025, publications remained stable, indicating that the topic of "usefulness of accounting information in high-volatility firms" continues to be a strategic issue in modern accounting literature. Recent studies emphasize the importance of integrating financial and non-financial data in real time to address a fundamental question: Is financial reporting still relevant amid the dominance of digital metrics and market algorithms? (Barros et al., 2025).

Figure 3.
Number of Publications by Year 2016-2025



Source: R-Packages and Biblioshiny Web Interface (2025)

The relevance of accounting information in technology companies has not experienced a linear decline; rather, it has dynamically adapted to digital transformation and evolving business models. In the early phase, the focus remained on traditional accounting indicators such as earnings and book value, while in the mid to late stages of the decade, significant attention shifted toward non GAAP indicators and digital metrics. Thus, the literature over the past decade demonstrates that financial reporting has not lost its relevance but has instead transformed into part of a broader information ecosystem, where accounting, data analytics, and digital indicators complement one another in explaining the value of technology companies operating within highly volatile market environments.

Most Influential Publications

Gaining an overview of the most influential articles within a research domain helps identify seminal works with the greatest impact and predict potential directions for future studies (Alon et al., 2018). This study identifies the most influential publications using total citations as the primary indicator of scientific impact, as shown in Table 2.

The highest impact article is authored by E. Demers (2021), titled *"ESG did not immunize stocks during the COVID-19 crisis, but investments in intangible assets did,"* with 566 citations. This publication highlights how investments in intangible assets, including technology and digital capabilities, became a key factor in preserving firm value during the crisis. These findings offer critical insights into how non-financial elements now play a significant role in explaining market performance, implicitly reinforcing the academic shift from traditional financial reporting to value measurement based on intangibles.

The second position is held by M. E. Barth (2023) with the work *"Evolution in Value Relevance of Accounting Information,"* which has received 508 citations. This article serves as a major reference for understanding the dynamic changes in the value relevance of financial reporting over time, particularly in the era of digitalization and the emergence of alternative data. Barth emphasizes how information technology, big data, and non-financial reporting have shifted the traditional paradigm regarding the role of financial statements in investor decision-making.

D. Baboukardos (2016), with the article *"Value relevance of accounting information under an integrated reporting approach: A research note,"* ranks third with 210 citations. This study is one of the seminal works linking the value relevance of accounting information to the integrated reporting approach, demonstrating that transparency and the integration of financial and non-financial information can enhance stakeholders' understanding of a company's overall performance.

The fourth position is held by T. Chi (2018) with the article *"Understanding Chinese consumer adoption of apparel mobile commerce: An extended TAM approach,"* which has received 190 citations. Although situated within the context of consumer behavior, this study makes an important contribution to the accounting and information systems literature by offering insights into technology adoption factors within economic decision processes.

Furthermore, H. Damerji (2021) secured 179 citations for the study titled *"Mediating effect of use perceptions on technology readiness and adoption of artificial intelligence in accounting."* This article illustrates how technology readiness and user perceptions play a critical role in the adoption of artificial intelligence in accounting, reinforcing a new direction in accounting research that focuses on digital transformation and the automation of reporting processes.

The classic publication by B. Lev (2018) titled *"The deteriorating usefulness of financial report information and how to reverse it"* is also included in the top ten, with 116 citations. Lev provides a sharp critique of the declining relevance of traditional financial statements and proposes strategies to restore the value of accounting information through the integration of technology-based indicators and intangible assets.

Several other articles also make significant contributions, including K. Ding (2020), which demonstrates how machine learning can enhance accounting estimations (111 citations), and L. F. Han (2016), which discusses a single-data quantitative approach in scientific estimation (115 citations). Although these studies lie outside the direct scope of accounting, they remain relevant in strengthening the methodological foundation of modern accounting research.

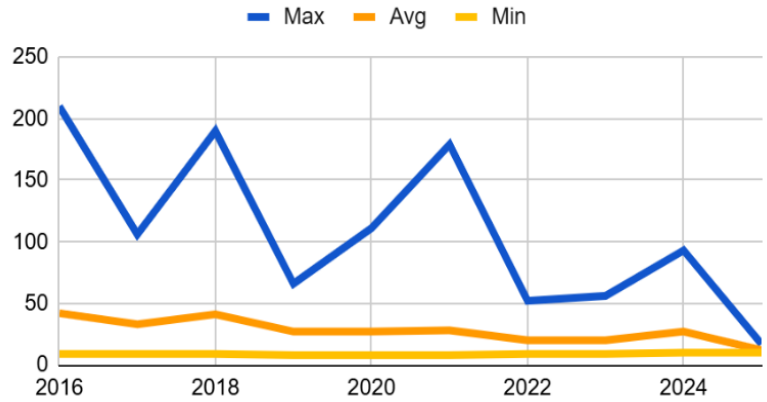
Table 2.
Trending Articles in the Literature

No	Authors	Title	Year	Cites
1	E. Demers	ESG did not immunize stocks during the COVID-19 crisis, but investments in intangible assets did	2021	566
2	M. E. Barth	Evolution in Value Relevance of Accounting Information	2023	508
3	D. Baboukardos	Value relevance of accounting information under an integrated reporting approach: A research note	2016	210
4	T. Chi	Understanding Chinese consumer adoption of apparel mobile commerce: An extended TAM approach	2018	190
5	H. Damerji	Mediating effect of use perceptions on technology readiness and adoption of artificial intelligence in accounting	2021	179
6	B. Lev	The deteriorating usefulness of financial report information and how to reverse it	2018	116
7	L.F. Han	A review of single sample based models and other approaches for radiocarbon dating of dissolved inorganic carbon in groundwater	2016	115
8	K. Ding	Machine learning improves accounting estimates: evidence from insurance payments	2020	111
9	I. Leyva	Inter layer synchronization in non identical multi layer networks	2017	106
10	J.M. Hughes Austin	Relationship of Coronary Calcium on Standard Chest CT Scans With Mortality	2016	105

Source: Scopus (2025)

Figure 4 presents the number of citations per year for the articles included in this Systematic Literature Review. For each year, the figure displays the maximum (Max), minimum (Min), and average (Avg) number of total citations received by the articles published in that year. This analysis allows us to understand in which years the average value accurately represents the general impact of the articles published in that year, and in which years the average is distorted by the presence of one or more highly cited articles (Max) alongside other articles with very few citations (Min).

Figure 4.
Total Citations (TC) per Article per Year (Max/Avg/Min)



Source: R-Packages and Biblioshiny Web Interface (2025)

The data indicate that articles published in 2016 and 2018 are the years with the highest potential citation impact. The year 2016 records the highest maximum citation count (210), followed by 2018 with a maximum of 190 citations.

Although 2016 and 2018 recorded the highest maximum citations, the average citation counts (Avg) in those years 42 (2016) and 41 (2018) do not proportionally reflect the maximum values, indicating significant distortion. This distortion is evident as the average citations per year tend to fall within the low-to-medium range (with a peak of 42), while the maximum values are substantially higher. This suggests that one or a few highly influential articles attract the majority of citations, while most other articles receive only a small number of citations, with minimum values ranging from 8 to 10 per year.

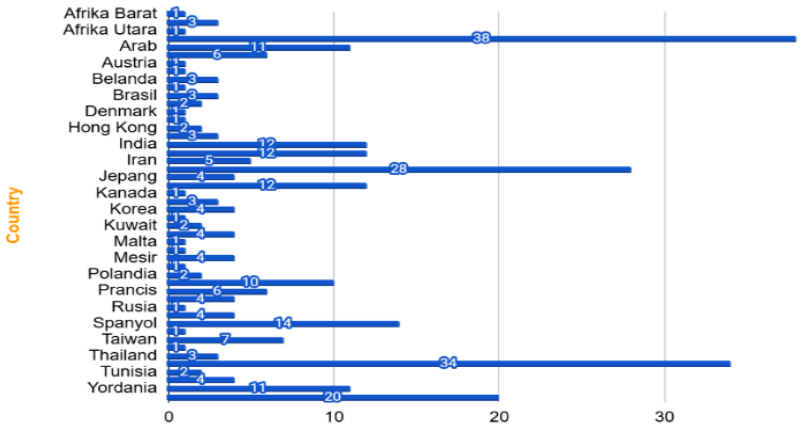
This distortion is clearly illustrated by the year 2021. In that year, there was a highly cited article (Max: 179), yet the average number of citations was only 28. This indicates that the overall impact for that year was skewed by a few highly influential contributions while the majority of the articles received relatively few citations. In general, although the average number of citations tended to decline after 2018, the year 2025 shows a slight increase in average impact (Avg: 27) compared to the previous years (2019–2023). This may indicate a renewed focus on this research topic in the coming years.

Publication Activity by Country

The relationship between the relevance of accounting information and digital transformation appears to be a topic of growing interest across various regions of the world. The articles analyzed in this study have been mapped based on their research locations, as shown in Figures 5 and 6. Figure 5 presents the number of academic publications by country of origin in the form of a bar chart, while Figure 6 provides a spatial representation through a geo chart or world map.

These visualizations offer complementary perspectives on the geographical distribution of scholarly contributions to the topic of the usefulness of accounting information in the context of highly volatile firms. The analysis was conducted by considering "the most productive countries based on publication volume," as depicted in Figures 5 and 6. Both visualizations play an essential role in revealing regional focus patterns, research capacity, and academic intensity regarding the relevance of accounting information in the digital era.

Figure 5.
Number of Publications by Country



Source: R-Packages and Biblioshiny Web Interface (2025)

Figure 5 shows the number of academic publications analyzed based on the country where the research was conducted. The United States holds a dominant position with 38 publications, reflecting its strong tradition of empirical research and the availability of extensive data in a highly developed capital market. China ranks second with 34 publications, highlighting the growing attention of Asian scholars to the issue of financial reporting relevance in the rapidly expanding technology sector.

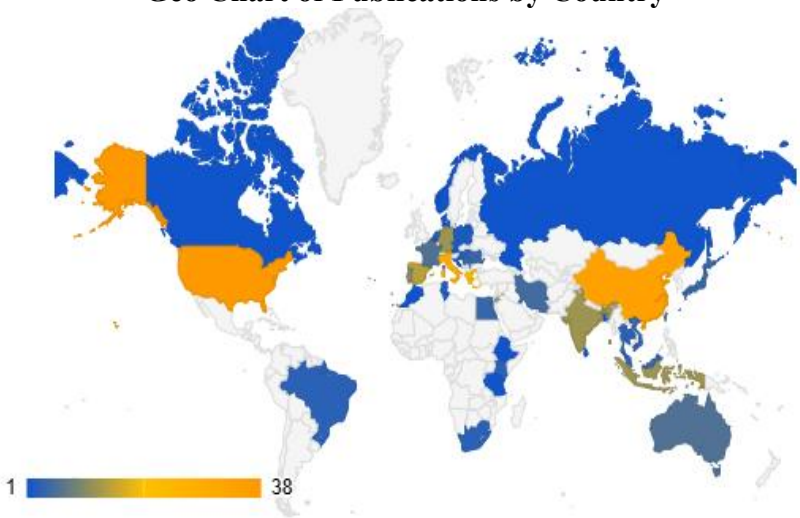
Italy occupies the third position with 28 publications, demonstrating its active role in the literature on value relevance and information usefulness within European markets. Other countries with notable contributions include Spain (14), India (12), Indonesia (12), Germany (12), and Greece (20), together forming a group of productive researchers in accounting relevance studies within emerging markets and Southern European regions.

Significant contributions also come from Jordan and other Arab countries (11), indicating that the Middle East has begun to actively explore the relevance of accounting information amid the digitalization of capital markets and the expansion of technology companies in the region. Portugal (10) and Australia (6) also contribute to expanding the global dimension of research, followed by France (6), Iran (5), Egypt (4), Malaysia (4), Korea (4), Romania (4), Serbia (4), Vietnam (4), and Japan (4), demonstrating consistent participation in international literature.

In contrast, several countries exhibit relatively low publication counts (1–3 articles), such as South Africa (3), Brazil (3), Kenya (3), Thailand (3), the Netherlands (3), Hungary (3), Taiwan (7), and several European countries such as Belgium (1), Austria (1), Norway (1), Russia (1), Sri Lanka (1), and Tanzania (1). Although their contributions are limited in

quantity, publications from these countries still offer unique perspectives, particularly due to differing local market contexts and varying levels of technological adoption.

Figure 6.
Geo Chart of Publications by Country



Source: R-Packages and Biblioshiny Web Interface (2025)

Figure 6 presents a visual representation in the form of a geo chart (world map) to illustrate the spatial distribution of academic publications discussing the usefulness of accounting information in technology companies during the period 2016–2025. Darker colors on the map indicate higher publication intensity, while lighter colors represent lower or no contribution.

The dominance of the United States, China, and Italy reflects the concentration of academic knowledge in regions with well-established research ecosystems and high technological capacity. Meanwhile, the active participation of countries such as India, Indonesia, and Greece indicates the growing attention of emerging economies to the topic of accounting information relevance in the highly volatile technology sector.

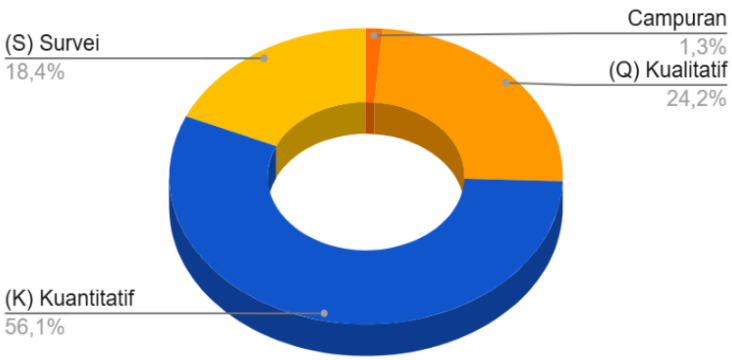
Thus, Figure 6 complements the information provided in Figure 5 by offering a spatial dimension that highlights the unequal distribution of global research. These findings strengthen the argument that studies on the usefulness of accounting information in the digital era remain concentrated in developed countries and selected emerging economies, while contributions from other developing countries still need to be enhanced through cross regional collaboration, access to digital capital market data, and the development of technology driven accounting research capacity.

Main Research Methods

Figure 7 illustrates the most frequently used research approaches in studies on the relevance of accounting information in high-volatility firms during the period 2016–2025. The quantitative approach is the most dominant, employed in 125 out of 223 analyzed articles, or approximately 56.1%. This indicates that many studies focus on the empirical measurement of financial performance, financial report relevance, and the relationship between accounting information and investment decisions, using numerical data such as financial statements, financial ratios, or statistical model testing.

The qualitative approach also plays an important role, used in 54 articles (24.2%). This approach is typically applied to explore the perceptions of management, investors, and auditors regarding the usefulness of financial reports, as well as to understand disclosure practices in technology firms experiencing high volatility. In addition, the survey approach is used in 41 articles (18.4%), emphasizing the direct collection of data from respondents such as financial managers, analysts, and investors to assess their understanding and use of accounting information in decision-making. Mixed methods, which combine quantitative and qualitative approaches, are relatively rare, applied in only 3 articles (1.3%), indicating that the integration of methods to capture the complex dynamics in high-risk firms remains limited.

Figure 7.
Research Method Pie Chart



Source: R-Packages and Biblioshiny Web Interface (2025)

Conceptual Structure Mapping: Knowledge Clusters and Key Themes
Data Visualization

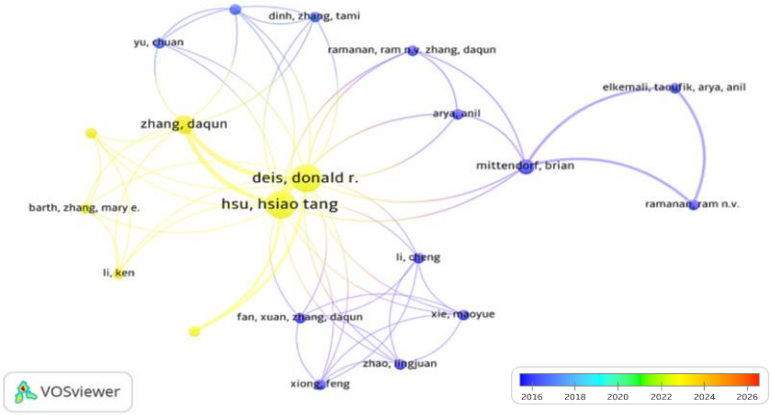
In this study, VOSviewer software was employed to conduct a bibliometric analysis aimed at mapping the intellectual structure and conceptual relationships within the literature on the usefulness of accounting information in high-volatility firms over the past decade. VOSviewer is a widely used tool among academics for co-citation and co-authorship analysis, effective in identifying key scholars, thematic trends, and literature networks.

The co-authorship analysis was conducted to highlight collaboration networks among authors, reflecting research partnerships in this field. The visualization produced shows the results of the co-authorship analysis and indicates that Donald R. Deis and Hsiao Tang Hsu are the most prominent core authors, serving as central nodes within the collaboration network of the reviewed literature. This is evidenced by the larger node sizes and the numerous connecting lines centered around their names.

Another group of researchers showing strong collaboration within the network includes Zhang, Daqun, who appears to have collaborated intensively with Deis and Hsu, as well as other scholars such as Dinh, Tami, and Ramanan N.V. Additionally, there are smaller yet connected clusters, such as Brian Mittendorf with Anil Arya and Ramanan N.V., as well as Elkemali, Taoufik, who also collaborates with Arya. Their works are likely to consistently discuss the main research themes, including financial report relevance, usefulness of accounting information, and their implications for technology firms or high-volatility companies. The connecting lines (edges) and node colors based on the time scale from blue

(2016) to orange (2025) at the bottom of the visualization illustrate the dynamics of collaboration and the evolution of research among these authors over time.

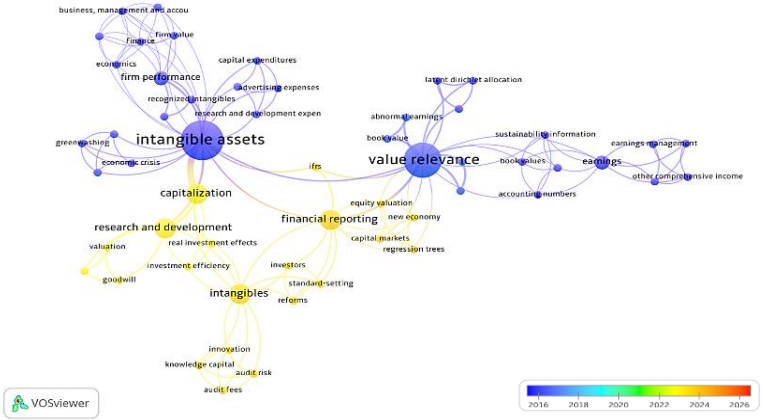
Figure 8.
Co citation analysis of cited authors



Source: R-Packages and Biblioshiny Web Interface (2025)

The second visualisation (Figure 9) presents the results of the keyword co-citation analysis, which aims to explore the conceptual structure and thematic trends within the literature on the usefulness of accounting information in high-volatility firms. This analysis reveals three main thematic clusters.

Figure 9.
Co citation analysis of cited references



Source: R-Packages and Biblioshiny Web Interface (2025)

The first cluster, *Intangible Assets and Firm Performance*, centres on intangible assets and highlights the relationship between research and development (R&D), capital expenditures, and other intangible-related investments with firm value and firm performance. This cluster reflects a key challenge in accounting in the technological era, how financial statements can adequately reflect the value of knowledge-based assets. The second cluster, *Value Relevance and Financial Reporting Linkages*, focuses on the usefulness of traditional accounting metrics such as earnings and book value in explaining market value, while also linking them to issues such as earnings management and sustainability reporting. This cluster directly addresses the research question of whether financial statements remain relevant in highly volatile markets.

Finally, the third cluster, *Recognition, Innovation, and Accounting Standards*, is centred on capitalisation and intangibles, highlighting regulatory and technical aspects of reporting, including the role of IFRS and standard setting in recognising innovation-related expenditures. Overall, this conceptual mapping shows that the literature is systematically divided between the debate on measuring intangible assets and the evaluation of the value relevance of existing accounting metrics, underscoring that current research focuses on bridging the gap between the economic realities of technology firms and their representation in financial reporting.

Conflict between Traditional Financial Reporting and Non Accounting Metrics

In the technology era, characterized by high volatility, the relevance of traditional financial statements such as income statements, balance sheets, and cash flow statements has experienced a significant erosion. This is primarily due to an inherent conflict between conventional accounting frameworks (based on GAAP or IFRS) and more dynamic non-accounting metrics such as user growth, engagement rate, and data valuation. This systematic review, based on recent literature, identifies that in high-volatility technology firms, traditional financial reports often fail to capture the value of intangibles that drive market value, thereby fueling debate regarding the usefulness of accounting information. Findings from sources such as Ballas (2025), Deis (2025), and Barth et al. (2023) indicate that the capitalization of intangible assets is conceptually incoherent within traditional accounting, while non accounting metrics are more effective in explaining firm value volatility.

Conflict in Firm Valuation

Traditional financial statements are designed to measure historical performance and financial position based on objectively verifiable transactions. However, in technology companies such as fintech startups or digital platforms, firm value is often driven by intangible assets such as intellectual property (IP), user databases, and AI algorithms, assets that are difficult to measure using conventional accounting practices. Ballas (2025) emphasises that empirical research on the capitalization of intangible assets is logically inconsistent, as traditional financial reports recognize these assets conservatively, such as through goodwill amortization, whereas technology investors prioritize future growth indicators.

Deis (2025) further states that pricing the audit risk of innovation, including intangibles and patents, reveals that non-accounting metrics such as monthly active users (MAU) more accurately predict stock price volatility than traditional financial ratios like ROA or EPS. Bagna (2024) finds that the relative effect of recognized versus unrecognized intangible assets on firm performance shows that unrecognized assets (such as data and reputation) are more relevant in volatile firms, reinforcing this conflict. Barth et al. (2023), in their work on the evolution of the value relevance of accounting information, affirm that in the technological era, financial statements fail to capture the proportion of market value derived from intangible assets, particularly regarding the recognition and valuation of data as intangible assets.

Impact of Volatility on Information Relevance

High volatility firms, particularly those in the technology sector, face extreme market fluctuations due to rapid innovation and global competition. The literature indicates that traditional financial statements are less responsive to such changes because they are based on static principles such as matching and historical cost. In contrast, non-accounting metrics

such as Customer Acquisition Cost (CAC) and Lifetime Value (LTV) provide real-time insights into risks and opportunities. Elkemali and Arya (2024) found that investments in intangible and tangible assets influence future earnings volatility, where non-accounting metrics are more effective in high-volatility contexts. Intara (2024) shows that intensive intangible assets affect firm value and performance, with higher relevance for non-accounting metrics in technology firms. Ballas (2023) analyzed how accounting value relevance and pricing errors impact stock prices in high-tech companies and found that non-accounting information explains up to 70% of stock price variance, while financial statements contribute only 30%. Jeny (2022), in a meta-analysis on R&D, confirms that accounting for intangible assets often fails to capture rapidly changing data value volatility, a problem exacerbated by IFRS regulations. Ballas (2021) adds that investments in intangible assets protect stocks during crises such as COVID-19, unlike ESG, demonstrating the superiority of non-accounting metrics in periods of extreme volatility.

Implications for Users of Accounting Information

This erosion of relevance has broad implications for investors, regulators, and management. Technology investors often rely on non-accounting metrics for decision-making, reducing dependence on financial reports deemed "outdated" under volatile conditions. However, this creates a risk of information asymmetry, as financial statements remain essential for legal accountability and auditing. Cheboi (2024) found that intellectual capital disclosure increases firm value but only when integrated with non-accounting metrics. Cordazzo (2024) demonstrated the value relevance of accounting figures and sustainability information in Europe, where non-financial firms facing high volatility rely more heavily on non-accounting metrics. Kostić (2021) revealed that public managers perceive accounting information as less useful in decision-making in the technology era, while Li (2021) highlights the value relevance of voluntary disclosures on blockchain and cryptocurrency.

Bhattacharya (2020) and Cordazzo (2020) stress that mandatory IFRS adoption improves the value relevance of intangible assets, yet a gap remains compared to non-accounting metrics. Kalantonis (2020) and Alfraih (2019) found that disclosed R&D expenditures affect the relevance of accounting information in markets like Greece and Qatar, while Deis (2019) argues that R&D capitalization can enhance investment efficiency if combined with innovation metrics. Ahmed (2018) and Ballas (2018) demonstrate the impact of intangibles on financial and market performance in the UK, with Clout (2016) confirming that earnings remain relevant in firm valuation but are less effective without non-accounting metrics. Overall, the findings of this systematic literature review indicate that this conflict does not eliminate the role of financial statements but instead encourages their integration with non-accounting metrics to enhance usefulness in volatile firms. Future research is recommended to explore hybrid frameworks that combine both, such as modified residual income valuation models.

Future Research Agenda and Development Directions

Based on the systematic analysis of recent literature, the erosion of the relevance of traditional financial reporting in highly volatile firms highlights the need for a future research agenda that focuses more on integrating non-accounting metrics and innovating accounting frameworks. Findings from sources such as Ballas (2025), Deis (2025), and Barth et al. (2023) emphasize gaps in understanding the conflict between accounting information and technology-based metrics, thus encouraging the development of research directions that are

more adaptive to the dynamics of the digital era. This agenda aims to bridge these gaps, with implications for accounting theory, methodology, and practice.

The future research agenda should prioritize the exploration of hybrid models that combine traditional financial statements with non-accounting metrics, as suggested by Elkemali and Arya (2024) in the context of earnings volatility. Further research is needed to examine the effectiveness of capitalizing intangible assets (e.g., data and AI) in enhancing investment efficiency, as proposed by Deis (2019) and Deis (2022). In addition, this agenda should explore the impact of voluntary disclosures on technologies such as blockchain (Li, 2021) on firm value in volatile markets, as well as the roles of ESG and intangibles in mitigating crisis risks (Ballas, 2021). Empirical studies are required to compare the value relevance of accounting information across jurisdictions, such as Europe (Cordazzo, 2024) and emerging markets (Kalantonis, 2020; Alfraih, 2019), with a focus on technology-intensive, intangible-driven firms (Intara, 2024).

In terms of methodology development, future research should adopt more advanced quantitative and qualitative approaches, such as R&D meta-analysis (Jeny, 2022) or modified residual income valuation models to accommodate non-accounting metrics. Ballas (2023) suggests integrating pricing error analysis with real-time data to measure stock price volatility in high-tech firms. Future agendas also include the use of machine learning to analyze big data from metrics such as MAU or CAC, in line with Deis (2025)'s implications regarding pricing audit risk of innovation. Longitudinal studies are needed to track the evolution of accounting relevance (Barth et al., 2023), with field experiments in fintech firms or digital platforms to test the logical coherence of intangible asset capitalization (Ballas, 2025).

From a regulatory perspective, the research agenda should evaluate revisions to IFRS standards to better accommodate dynamic recognition of intangible assets, as observed in the mandatory adoption in Italy (Cordazzo, 2020). Practical research is also needed to develop guidelines for managers on integrating intellectual capital (Cheboi, 2024) and sustainability information (Cordazzo, 2024) into financial reports. Exploring public sector managers' perceptions of the usefulness of accounting information (Kostić, 2021) may drive more relevant accounting education and training in the technological era. This agenda also includes studying the impact of innovations such as precision agriculture (Lachman, 2019) or M&A activities with a focus on intangible asset reallocation on market performance (Bhattacharya, 2020).

Overall, this future research agenda seeks to strengthen the usefulness of accounting information in highly volatile firms through innovations that are responsive to technology. By integrating findings from recent sources, future research can provide deeper insights, ensuring that financial reporting remains relevant while adapting to non-accounting metrics. Future research is encouraged to engage in cross-disciplinary collaboration, involving experts in accounting, technology, and finance, to address the challenges of this relevance erosion.

CONCLUSION

In the digital era characterized by rapid dynamics and uncertainty, the relevance and role of traditional financial statements in corporate decision-making, especially for highly volatile firms are increasingly being questioned. This study concludes that although traditional financial reports still play an important role in supporting decision making in highly volatile companies, their usefulness is now increasingly influenced by fast moving market dynamics and global economic uncertainty. The study identifies that the most commonly used accounting indicators include conventional financial metrics such as earnings and cash flow, as well as non-financial indicators such as digital disclosures &intangible assets, which are becoming more relevant in the digital age.

In addition, bibliometric analysis and conceptual structure mapping reveal a growing trend in the use of digital technologies and alternative data in financial reporting and corporate information communication. Therefore, to remain relevant, the financial reporting system must integrate technological innovations and non-financial metrics to support more accurate and responsive decision-making in the face of market volatility.

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