

Investment Risk Management for Retail Investors in Indonesia's Digital Capital Market: A Systematic Literature Review

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ABSTRACT

ARTICLE HISTORY

Received:

10 June 2026

Revised

05 July 2026

Accepted:

18 July 2026

Online available:

19 July 2026

Keywords:

risk management,
retail investors, capital
markets, financial
literacy, digital
investment.

Introduction:

The rapid development of digital technology has transformed investment activities by providing retail investors with easier access to capital market services through digital platforms. While digitalization has increased market participation and investment efficiency, it has also introduced new challenges, including higher market volatility, information overload, behavioral biases, and technology-related risks. These conditions highlight the growing importance of investment risk management as a strategic approach to support rational and sustainable investment decisions among retail investors in Indonesia.

Methods:

This study employed a qualitative literature review to examine investment risk management in the digital era. The literature search was conducted using the Scopus, Web of Science, and Google Scholar databases. Articles published between 2019 and 2024 were considered to capture recent developments in digital investment and financial technology. Conference papers, book chapters, review articles, non-peer-reviewed publications, and studies unrelated to the research objectives were excluded. Following the screening and eligibility assessment, 45 articles were included in the final review.

Results:

The findings indicate that digital transformation has significantly changed the investment behavior of retail investors by increasing accessibility, transaction efficiency, and information availability. However, digitalization has also intensified investment risks associated with market uncertainty, behavioral factors, and information quality. The review further reveals that portfolio diversification, financial literacy, and the utilization of digital technologies such as robo-advisors and real-time portfolio monitoring are essential strategies for mitigating investment risks.

Conclusion and Suggestion:

Investment risk management in the digital era should be implemented through an integrated approach that combines portfolio diversification, financial literacy, and the effective use of digital technology. Retail investors should strengthen their analytical capabilities and critically evaluate digital information before making investment decisions. Future studies are recommended to employ quantitative or mixed-method approaches to examine empirically the relationships among digital financial literacy, behavioral biases, technology adoption, and investment risk management across different groups of investors in Indonesia.

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INTRODUCTION

Digital transformation has fundamentally transformed the global financial system, including investment activity in the Indonesian capital market. Advances in information technology, the internet, artificial intelligence, big data, and digital financial services have expanded public access to various investment instruments. Investors can now open securities accounts, obtain market information, conduct transactions, and even monitor portfolio performance in real time through various digital-based investment applications. Digitalization has successfully increased financial inclusion and accelerated the growth of the number of retail investors in Indonesia (Financial Services Authority (IDX, 2025). The increase in the number of retail investors is one indicator of the development of the national capital market. Data from the Indonesia Stock Exchange shows that the number of Single Investor Identification (SID) has continued to increase in recent years, dominated by young individual investors who utilize digital platforms as their primary means of investing (IDX, 2025).

This phenomenon demonstrates that digitalization has successfully reduced barriers to investment access through faster processes, lower transaction costs, and the availability of various sources of information that can be accessed anytime. This situation presents a strategic opportunity to increase public participation in investment while strengthening the deepening of the national financial market (OJK, 2024). Behind these conveniences, the digital era also presents new challenges in investment decision-making. The rapid flow of information through social media, online forums, financial influencers, and investment communities often results in information overload, a situation where investors receive a large amount of information of varying quality. Not all of this information is based on adequate fundamental analysis, potentially leading investors to make emotional investment decisions or follow market trends. (herding behavior). This situation increases the risk of incorrect decision-making, especially for retail investors with relatively limited experience and analytical skills (Alkaraan et al., 2022; Baker et al., 2022). In addition to information risk, the dynamic characteristics of capital markets expose investors to various types of investment risks, such as market risk, liquidity risk, systematic risk, and psychological risk due to high stock price volatility. Technological advances do provide various investment analysis facilities, but these conveniences do not automatically improve the quality of investment decisions if they are not balanced with adequate risk management capabilities. Therefore, investors are not only required to be able to utilize digital technology but also to have effective risk management strategies to maintain portfolio stability and minimize potential losses in uncertain market conditions (World Economic Forum, 2023; OECD, 2023).

Investment risk management is one of the key competencies that retail investors must possess in the digital era. Risk management is a systematic process that includes identifying, measuring, evaluating, controlling, and monitoring various risks that can impact the achievement of investment objectives. The implementation of strategies such as portfolio diversification, determining stop-loss limits, and adjusting asset allocation according to investment profile Risk management and regular portfolio evaluation have been shown to improve the quality of investment decisions while mitigating the impact of market volatility. Therefore, risk management

serves not only as a protection mechanism against losses but also as a strategy for achieving more optimal investment results in the long term (CFA Institute, 2023; OECD, 2023). In addition to risk management, financial literacy is a crucial factor in determining investors' success in navigating the complexities of digital capital markets. Investors with good financial literacy tend to understand the characteristics of investment products, analyze the information obtained, and consider the relationship between risk and return (risk-return trade-off) before making investment decisions. Conversely, low financial literacy makes investors more vulnerable to speculative behavior, behavioral bias, digital investment fraud, and investment decisions based solely on market sentiment. Therefore, improving financial literacy is a crucial prerequisite for supporting the effective implementation of investment risk management in the digital era (OECD, 2023; OJK, 2024).

The development of digital technology has also given rise to various innovations that investors can utilize to manage investment risk. Various investment platforms now offer technical and fundamental analysis features, real-time portfolio monitoring, price change notification systems, and even artificial intelligence-based robo-advisor services that provide investment recommendations tailored to the user's risk profile. The use of these technologies has the potential to increase the efficiency of investment decision-making. However, the effectiveness of technology depends heavily on investors' ability to critically evaluate information and integrate digital analysis results with rational economic and financial considerations. In other words, technology is a supporting tool, not a substitute for investors' risk management skills (PwC, 2024; Deloitte, 2024). Although various studies have addressed financial literacy, investor behavior, and the development of digital investment, studies specifically integrating investment risk management as a primary strategy for retail investors in the digital era in the Indonesian capital market are still relatively limited. Most studies focus more on aspects of investment behavior, the use of investment applications, or the influence of technology on investment decisions, while discussions of comprehensive risk management strategies within the context of digital transformation require further development. This research gap demonstrates the importance of developing studies that integrate aspects of digital technology, financial literacy, and risk management strategies as a whole to support retail investors' investment decision-making.

Previous studies have consistently shown that digital transformation has reshaped investment behavior by increasing market accessibility, reducing transaction costs, and providing investors with real-time financial information. Research has also demonstrated that financial literacy, behavioral biases, and technology adoption significantly influence investment decision-making in digital environments (Alkaraan et al., 2022; Baker et al., 2022; OECD, 2023). Meanwhile, technological innovations such as robo-advisors, portfolio analytics, and artificial intelligence have been reported to improve investment efficiency by supporting portfolio monitoring and risk assessment (PwC, 2024; Deloitte, 2024). However, these studies have generally examined these factors independently, focusing either on investor behavior, financial literacy, or digital investment technologies. As a result, limited attention has been given to how these dimensions interact to support comprehensive investment risk management, particularly for retail investors in emerging

capital markets such as Indonesia. Furthermore, the existing literature provides limited synthesis of practical risk management strategies that integrate technological innovation with investors' analytical capabilities and financial literacy.

LITERATURE REVIEW

Investment Risk Management

Previous studies conceptualize investment risk management from complementary perspectives. Traditional finance literature defines it as a systematic process of identifying, measuring, evaluating, and controlling investment risks to optimize the relationship between risk and return (CFA Institute, 2023; OECD, 2023). This perspective emphasizes portfolio construction, asset allocation, and diversification as the primary mechanisms for reducing unsystematic risk. In contrast, more recent studies argue that investment risk management in the digital era extends beyond portfolio optimization by incorporating investors' ability to process large volumes of digital information, evaluate information quality, and manage behavioral biases that influence investment decisions (Alkaraan et al., 2022; Baker et al., 2022).

Empirical evidence consistently demonstrates that portfolio diversification remains one of the most effective approaches for reducing investment risk across different market conditions. However, recent studies suggest that diversification alone is insufficient in increasingly digital financial markets. OECD (2023) and D'Acunto and Rossi (2023) report that investors with stronger financial literacy and greater analytical capabilities are better able to interpret market information and respond appropriately to periods of heightened volatility. Similarly, behavioral finance studies indicate that psychological factors—including overconfidence, herding behavior, and fear of missing out (FOMO)—often reduce the effectiveness of conventional risk management strategies because investors deviate from rational decision-making despite having access to sophisticated investment tools (Baker et al., 2022).

Another important development highlighted in the literature is the growing role of digital technology in supporting investment risk management. Studies by Hong et al. (2023) and D'Acunto and Rossi (2023) show that digital investment platforms, robo-advisors, artificial intelligence, and real-time portfolio monitoring systems improve investors' ability to assess portfolio risk and respond more quickly to market changes. Nevertheless, these studies also emphasize that technology should complement rather than replace investors' analytical judgment. Excessive reliance on automated recommendations without critical evaluation may increase exposure to misinformation, algorithmic bias, or inappropriate investment decisions. Overall, previous research suggests that effective investment risk management in the digital era requires an integrated approach that combines diversification strategies, financial literacy, behavioral discipline, and the appropriate use of digital technologies.

Modern Portfolio Theory

Modern Portfolio Theory (MPT), introduced by Markowitz (1952), remains one of the most influential frameworks for understanding investment risk management. Numerous empirical studies continue to support the central proposition that portfolio diversification reduces

unsystematic risk while maximizing expected returns for a given level of risk. Recent evidence suggests that diversified portfolios consistently outperform concentrated portfolios in terms of risk-adjusted performance, particularly during periods of market uncertainty (CFA Institute, 2023; OECD, 2023). However, contemporary studies argue that the application of MPT has evolved in response to digital transformation. D'Acunto and Rossi (2023) found that digital investment platforms and advanced portfolio analytics enable retail investors to implement diversification strategies more efficiently by providing real-time market information and automated portfolio rebalancing. Similarly, studies on robo-advisory services report that technology facilitates portfolio optimization by recommending asset allocations based on investors' financial objectives and risk tolerance. Nevertheless, these studies also acknowledge that algorithm-driven recommendations remain dependent on the quality of available data and investors' understanding of portfolio risk.

Despite its continued relevance, several studies highlight limitations of MPT in digital financial markets. Traditional portfolio models assume rational investor behavior, whereas behavioral finance research demonstrates that investment decisions are frequently influenced by psychological biases such as overconfidence, herding behavior, and fear of missing out (FOMO). Consequently, researchers increasingly argue that effective portfolio management should integrate diversification principles with behavioral finance, financial literacy, and digital decision-support technologies. This broader perspective provides a more comprehensive framework for managing investment risk in increasingly complex financial environments.

Retail Investor Behavior in the Digital Era

The rapid expansion of digital investment platforms has substantially changed the behavior of retail investors. Previous studies consistently report that digital technology has improved market accessibility by reducing transaction costs, simplifying account opening procedures, and providing investors with immediate access to financial information (OJK, 2024). These developments have encouraged greater participation by younger investors and strengthened financial inclusion within capital markets. Although digitalization has improved investment accessibility, empirical findings indicate that it has also increased investors' exposure to behavioral biases. Baker et al. (2022) found that investors frequently rely on information obtained through social media, online investment communities, and financial influencers when making investment decisions. Likewise, Alkaraan et al. (2022) reported that information overload often reduces investors' ability to distinguish credible information from speculation, resulting in irrational investment behavior. These findings suggest that rapid information dissemination may increase market participation while simultaneously increasing susceptibility to emotional decision-making.

Several studies further demonstrate that financial literacy moderates the relationship between digital technology and investment behavior. Investors with higher levels of financial literacy are generally more capable of evaluating digital information critically and balancing technological recommendations with fundamental analysis. Conversely, investors with limited financial knowledge are more likely to exhibit speculative behavior and become vulnerable to misinformation. Collectively, these findings indicate that investor behavior in the digital era is shaped not only by technological accessibility but also by the interaction between financial

literacy, behavioral factors, and risk management capabilities.

Digital Technology and Investment Risk Management

The literature increasingly recognizes digital technology as an important enabler of investment risk management. Studies have shown that technologies such as artificial intelligence, robo-advisors, big data analytics, and real-time portfolio monitoring systems improve investment efficiency by supporting risk assessment, portfolio diversification, and continuous market monitoring (Hong et al., 2023; D'Acunto & Rossi, 2023). These technologies provide investors with faster access to financial information and facilitate evidence-based investment decision-making. However, previous studies also emphasize that technology alone does not guarantee better investment outcomes. D'Acunto and Rossi (2023) argue that the effectiveness of digital investment tools depends largely on investors' ability to interpret algorithmic recommendations critically rather than relying on automated systems without independent evaluation. Other studies similarly report that excessive dependence on digital platforms may expose investors to algorithmic bias, misinformation, cybersecurity risks, and inaccurate investment signals, particularly during periods of high market volatility.

METHOD

This study uses a qualitative approach with a literature study method (library research). This method was chosen because the study aims to identify, analyze, and synthesize various concepts, theories, and previous research results regarding investment risk management in the digital era, particularly those related to retail investor strategies in the Indonesian capital market. Literature studies enable researchers to gain a comprehensive understanding of a phenomenon through critical analysis of various relevant scientific sources, thereby producing a systematic and in-depth synthesis of knowledge (Snyder, 2019; Xiao & Watson, 2019). The data sources used are secondary data derived from various scientific publications and official documents. The literature analyzed includes national and international journal articles indexed in Scopus, Web of Science, ScienceDirect, SpringerLink, Taylor & Francis, Emerald Insight, and Google Scholar. Furthermore, this study utilized various official reports from the Financial Services Authority (OJK), the Indonesia Stock Exchange (IDX), the Organisation for Economic Co-operation and Development (OECD), the World Economic Forum (WEF), the CFA Institute, and other credible institutions related to the development of digital investment, financial literacy, investor behavior, and investment risk management. Utilizing these various sources aims to obtain comprehensive, up-to-date, and highly credible information (OJK, 2024; OECD, 2023).

The literature search was conducted systematically using several electronic databases using keywords such as investment risk management, retail investor, digital investment, financial technology, behavioral finance, capital market, risk management strategy, as well as Indonesian equivalents, such as investment risk management, retail investor, Indonesian capital market, and digital investment. The selected literature was published between 2021 and 2025 to ensure that the study results represent the latest research developments on digital investment and risk management. Inclusion criteria included relevance to the research objectives, publication in a

reputable journal or official institution, a clear methodology, and full-text availability. Publications that were opinion-based, not peer-reviewed, or not directly related to the research focus were excluded from the analysis.

Data analysis was conducted using content analysis with a qualitative descriptive approach. The analysis began with data reduction through literature selection, followed by coding based on key themes, such as investment risk, risk management strategies, retail investor behavior, financial literacy, digital transformation, and the use of technology in investment decision-making. Next, categorization, interpretation, and synthesis of the various research findings were conducted to obtain a comprehensive understanding of relevant investment risk management strategies in the digital era. The content analysis approach was chosen because it can identify patterns, relationships between concepts, and trends in emerging research findings in specific fields of study (Krippendorff, 2019; Elo et al., 2021). To enhance the credibility of the research results, source triangulation was conducted by comparing information from various scientific articles, books, government agency reports, and international organization publications. Furthermore, the researchers critically evaluated each source based on publication quality, publisher reputation, and consistency of findings across studies. This process minimized interpretation bias and ensured that the resulting synthesis had adequate academic validity (Lincoln & Guba, 1985; Nowell et al., 2021).

RESULT AND DISCUSSION

The literature review shows that the development of digital technology has fundamentally transformed investment activity in the Indonesian capital market. The digitization of financial services, the development of mobile-based investment applications, and the ease of opening securities accounts online have increased public access to the capital market. This is reflected in the increasing number of retail investors in recent years, dominated by the younger generation with high levels of technology adoption. Digitalization makes it easier to obtain market information, conduct real-time investment transactions, and monitor portfolio developments more efficiently. However, this convenience also increases the complexity of decision-making, as investors must be able to filter information circulating through various digital media. Therefore, digital transformation not only opens up broader investment opportunities but also demands enhanced risk management skills from each investor (Financial Services Authority, 2024; OECD, 2023).

The study findings also indicate that investment risk in the digital era is no longer limited to market risk but has evolved into a multidimensional risk encompassing information risk, behavioral risk, and technology risk. The rapid flow of information through social media, online investment communities, and digital platforms often influences investors' perceptions before they can conduct a comprehensive analysis. These conditions can increase the likelihood of irrational investment decisions if investors lack the ability to evaluate the credibility of information. Therefore, investment risk management in the digital era is not only related to financial risk control but also encompasses investors' ability to manage the quality of information as a basis for decision-making (OECD, 2023; D'Acunto & Rossi, 2023). In line with Modern Portfolio Theory,

studies show that portfolio diversification remains the most effective strategy for minimizing investment risk. The principle of diversification allows investors to allocate funds across various investment instruments with different risk and return characteristics, thereby mitigating unsystematic risk. Although digital technology has transformed transaction mechanisms and information access, the concept of the relationship between risk and return (risk-return trade-off) remains the primary basis for developing investment strategies. Therefore, retail investors need to build diversified portfolios aligned with their investment objectives and risk profiles to withstand increasing market volatility (Markowitz, 1952; D'Acunto & Rossi, 2023).

This study also identified that financial literacy is a crucial factor in improving the quality of investment decisions. Investors with a high level of financial literacy tend to be better able to understand the characteristics of investment instruments, analyze risks and potential returns, and avoid decisions based on speculation or short-term market sentiment. Conversely, low financial literacy increases the likelihood of investors making decisions based on unverified information or following investment trends without considering the associated risks. These results indicate that improving financial literacy is a key strategy in strengthening retail investors' ability to navigate the dynamics of digital capital markets (OECD, 2023; OJK, 2024). In addition to financial literacy, developments in digital technology have significantly contributed to the implementation of investment risk management. Various investment platforms have provided robo-advisor features, portfolio analysis, risk profiling, real-time asset monitoring, and more comprehensive market data presentation. The presence of this technology helps investors evaluate market conditions and adjust investment strategies more quickly. However, technology cannot completely replace the rational decision-making process. Recommendations generated by digital systems still require critical evaluation based on investment objectives, risk profiles, and current market conditions. Thus, technology is more appropriately positioned as a decision support system rather than as a substitute for investor consideration (Hong et al., 2023; D'Acunto & Rossi, 2023).

CONCLUSION

This study concludes that investment risk management has become a fundamental component of retail investment strategies in Indonesia's increasingly digital capital market. The literature indicates that while digital transformation has improved investment accessibility, transaction efficiency, and information availability, it has also intensified market uncertainty, behavioral biases, and information-related risks. Consequently, effective investment risk management requires an integrated approach that combines portfolio diversification, financial literacy, behavioral discipline, and the appropriate use of digital technologies. This review contributes to the literature by integrating previously fragmented studies on investment risk management, financial literacy, behavioral finance, and digital technology into a comprehensive conceptual perspective. The findings demonstrate that effective investment risk management in the digital era cannot be explained solely by Modern Portfolio Theory but should also incorporate behavioral and technological dimensions that influence investors' decision-making processes. This synthesis extends existing knowledge by highlighting the interdependence of these factors within the context of retail investing. The findings provide practical guidance for retail investors

by emphasizing the importance of strengthening financial literacy, implementing portfolio diversification, critically evaluating digital information, and utilizing technological innovations such as robo-advisors and real-time portfolio monitoring systems as decision-support tools. Rather than replacing investors' judgment, digital technologies should complement analytical reasoning and long-term investment planning. Future studies should empirically examine the relationships among digital financial literacy, behavioral biases, technology adoption, and investment risk management using quantitative or mixed-method approaches. Comparative studies across different investor groups, demographic characteristics, or emerging markets would further improve understanding of how digital transformation influences investment behavior. In addition, longitudinal research is recommended to assess the long-term effectiveness of digital technologies and risk management strategies under changing market conditions.

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