



Financial Literacy, Risk Perception, and the Effectiveness of Digital Tools in Investment Decision-Making

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ABSTRACT

This study analyzed the impact of digital influence on financial decision-making, especially looking at how financial literacy and risk perception come into play. To figure out what investors know and how they feel about risk mixes with digital tools to affect their investment results. The team gathered data from 350 individual investors using structured questionnaires and ran the numbers with Structural Equation Modeling. Here's what stood out: when investors used digital tools, their investment outcomes improved a lot, but only when they already had strong financial knowledge. So, digital works best for people who understand finance. On top of that, risk perception made a difference. Investors who worried more about risk didn't get as much out of digital-driven advice, even if they were financially literate. Basically, digital tools can't guarantee you'll make smart investments unless you know what you're doing and you're not too risk averse. This research adds a new layer to behavioral finance and fintech by combining how people think and feel with the impact of digital. The study also offers something practical: if policymakers and financial institutions want people to thrive with these new tools, they need to build better financial literacy programs and encourage smart, responsible use of digital tools in finance.



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1. Introduction

1.1 Background of Problem

Technological revolution in the financial industry has been radical due to artificial intelligence. In the last ten years, digital tools had transformed the management of assets, credit ratings, fraud detection, and more precise investment guidance (Almansour, Elkrgli, & Almansour, 2023). These systems were used to analyze large volumes of data to draw trends and patterns that could not be easily identified by humans and thus improved quality and accuracy of financial decisions. With the increased pace of digitalization, digital tools became essential in enhancing financial inclusiveness and efficiency. Meanwhile, the role of financial literacy in the success of investing was comprehended more clearly. Financial literate people had a higher understanding of complex financial products and, therefore, tended to more effectively utilize digital tools (Gyau, Appiah, Gyamfi, Achie, & Naeem, 2024). Research has shown that financial literacy was like a nexus between technological innovation and better decision outcomes and gave investors an opportunity to comprehend and critically analyze digital-generated insights (Rasheed, Ishaq, Anwar, & Shahid, 2021). The most advanced digital systems may not produce optimal results to end users without the necessary financial knowledge.

The risk perception was also a key factor that defined the interaction between investors and digital-based financial tools. The behavioral finance research indicated that the perceived

risk determined the level of dependence on algorithmic recommendations (Imran, Ishaq, & Rashid, 2024). Automated decision-making was mostly doubtful to investors who perceived higher risks and more probable to gain using digital-assisted investment platforms by investors with moderate risk tolerance (Sinaga, Nuzula, & Damayanti, 2023). Therefore, risk perception, in addition to determining financial behavior, also mediated the connection between financial literacy and investment performance.

In spite of the fact that digital tools, financial literacy, and risk perception were studied thoroughly separately, the interaction between the three variables was under inspected. According to the available literature, there was little interest in the role of financial literacy in mediating the relationship between digital tools use and investment outcomes or how risk perception influenced that process (Mazhir Nadeem Ishaq, Batool, & Rasheed, 2021). Therefore, the present research study made a contribution to the body of literature by developing a holistic model that incorporates technological, cognitive, and psychological variables that influence financial decision-making.

1.2 Research Problem

Digital tools have moved fast in the financial world, but we still know surprisingly little about how it helps individual investors improve their results. Sure, the technology promises a lot. Digital tools can dig through mountains of data and speed up decisions like never before. But the reality isn't equal for everyone—some people get more out of these tools than others, and a lot depends on things like financial literacy and risk appetite (Khan, Shah, & Shafiq, 2023). Actual proof—hard evidence—showing how digital tools changes investment outcomes is still pretty thin. Most studies treat digital tools, financial literacy, and risk perception as if they're totally separate issues. They rarely look at how these things connect or influence each other. Hardly anyone has tested whether financial literacy actually explains how digital tools impacts investment performance, or how someone's attitude toward risk might shape that effect (Rasheed, Shahid, Mukhtar, & Ishaq, 2022).

1.3 Research Questions

Q1. What relationship existed between digital tools adoption in financial decision-making and investment outcomes?

Q2. Did financial literacy mediate the relationship between digital tools adoption and investment outcomes?

1.4 Research Objectives of the Study

To investigate the connection between the integration of digital tools in financial processes and the resulting investment performance

To investigate the mediating function of financial literacy concerning the effect of digital tools adoption on investment outcomes.

2. Literature Review

The role of financial literacy as a mediator in the investment decision process has been studied by an increasing number of researchers and demonstrates that literacy served as a mediating force that could be used by other factors (self-efficacy or demographic variables) to effect change (Mazhar Nadeem Ishaq, Rasheed, & Malik, 2022). In particular, the authors discovered that financial literacy facilitated the process of complex financial information and, therefore, the quality of investor decision-making (Rasheed, Ishaq, & Malik, 2022). However, the literature suggested some knowledge gap: there was limited research that had correlated financial literacy with technological use of digital tools or fintech in investment decision-making.

Financial literacy plays a crucial role in shaping how people invest. It helps them understand financial products, weigh risks and returns, and make smart decisions (Rasheed, 2016; Chen, 2020). The evidence is clear: people with higher financial literacy are more likely to join stock markets, diversify their portfolios, and think long term (Viet, Shuang, Rukhsana, Nadeem, & Abrar, 2017). But there's more to it than just knowing the basics. Researchers point out that strong application skills and good money-management attitudes also matter when it comes to investment outcomes (Rasheed, Ishaq, & Malik, 2022).

By 2017–2021, bibliometric reviews in the finance sector specifically showed that digital tools related research was expanding quickly and that certain sub-streams, such as risk assessment, fraud detection, algorithmic trading, and financial chatbots, were gaining popularity (Arner, Castellano, & Selga, 2022). Additionally, these studies have shown that while digital tools has the potential to significantly improve individual and institutional financial decision-making, its impact on investor behavior—as opposed to institutional processes—has not yet been thoroughly examined (Lusardi, A., & Mitchell, 2017). More significantly, in the context of financial decisions, the majority of the literature called for bridging the gap between digital tools supply (technical systems) and digital tools demand (how users interpret and use digital tools outputs (Rasheed, Xia, Ishaq, Mukhtar, & Waseem, 2016).

Risk perception and, as an individual subjective evaluation of the investment risk and uncertainty, has become the subject of growing interest in the behavioral finance literature as a factor in investment behavior (Rasheed, Ishaq, & Imran, 2022). Research indicated that when investors perceived risk more, they could better settle on the conservative way of investing, not use unfamiliar or technology-oriented platforms, and prefer low-volatility investments (Rukhsana, Xia, Nadeem, & Majid, 2017).

Critical reviews emphasized that although much research was done on risk perception and investment behavior, there is little research that used risk perception as a mediator in models of digital tools adoption or financial literacy trading in relation to investment performance (Rukhsana et al., 2017). The gap highlights the need to investigate moderated-mediation frameworks that incorporate risk perception in the technology adoption - literacy - investment performance relationship chain.

3. Research Methodology

3.1 Research Design

This study used a quantitative, explanatory research design to examine the relationship between individual investors' investment outcomes, risk perception, financial literacy, and adoption of artificial intelligence (digital tools). The idea that quantifiable constructs and statistical correlations could be used to explain mediating and moderating mechanisms between digital tools usage and investment success guided this design. By using a cross-sectional survey design, the researcher was able to gather standardized data on a large sample at one time. This approach would be suitable for using statistical modeling and mediation-moderation analysis to test causal inferences.

3.2 Data Collection, Population and Sampling

The study focused on individual investors in the financial markets who actually use digital tools driven tools things like robo-advisors, predictive analytics, and algorithmic trading systems. Most of these investors live in major cities Karachi, Lahore, Islamabad where financial technology is especially popular. We chose participants on purpose: they needed at least a year of investment experience and actual exposure to digital tools-supported decision tools. Out of 350 responses, 320 were valid after cleaning up the data. A G-Power analysis used to make sure the sample size was strong enough to test both mediation and moderation hypotheses with structural equation modeling (SEM), and the numbers checked out.

The study collected data using a structured questionnaire, available both online and in person. The online version ran on Google Forms, and we shared the link through investor communities, financial organizations, and social networks like LinkedIn and Telegram investment groups. We made it clear to participants that their responses would stay anonymous and confidential, and everyone gave their consent before starting. The

questionnaire covered five main areas: demographic information, digital tools adoption, financial literacy, risk perception, and investment performance. For each construct, we used measurement tools already validated in previous studies, but adjusted them to fit the context of digital tools driven financial decision-making. Data collection took eight weeks, from March to May 2023.

3.3 Data Analysis Methods

SmartPLS 4.0 and SPSS (Version 29) were used to process the data. To characterize the demographic characteristics and verify the data's normality, descriptive data were computed. The construct validity and reliability of the factors were then assessed using confirmatory factor analysis (CFA), which required factor loading to be greater than 0.70 and average variance extracted (AVE) to be greater than 0.50. The structural model was then tested using Partial Least Squares Structural Equation Modeling (PLS-SEM) to evaluate direct, indirect, and moderated relationships. The significance level was set at 0.05. In order to observe the lack of the multicollinearity issue, the variance inflation value was also confirmed.

4. RESULTS AND ANALYSIS

4.1 Descriptive Statistics

Descriptive statistics offered a picture of the features of the respondents and their predispositions in general in terms of digital tools adoption, financial literacy, the sense of risks, and investment returns.

Table 1
Demographic Characteristics of Respondents (N = 320)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	200	62.5
	Female	120	37.5
	Total	320	100.0
Age	20–29 years	80	25.0
	30–39 years	110	34.4
	40–49 years	90	28.1
	50 years and above	40	12.5
	Total	320	100.0
	Total	320	100.0
Education Level	Bachelor's	100	31.3
	Master's	160	50.0
	Ph.D.	60	18.7
	Total	320	100.0
Investment Experience	1–3 years	90	28.1
	4–6 years	130	40.6
	Above 6 years	100	31.3
	Total	320	100.0

The demographic findings showed that men constituted the largest proportion of the respondents (62.5%), meaning that more men were engaged in digital tools-based investment activities. The median age of most respondents was 30–39 years, which is the young and tech-oriented population segment that is more prone to using digital tools in making financial choices. The education data presented an indicative of 68.7% of people having a minimum of a master degree which indicated that the sample was well educated and could understand the complex financial technologies. The analysis has also shown that the highest number of participants were those with four to six years of experience in investment (40.6%), implying that the sample was comprised of moderate-experienced individuals who were likely to apply digital tools to make better decisions and not as beginners. The demographic trends facilitated the belief that the key users of digital technologies in investment management were educated and moderately experienced investors. In addition, the age and education distributions suggested that the use of digital tools was not reserved by highly specialized investors but was slowly entering the mainstream of qualified professionals. The results indicated that there is an increased tendency of technology use in investment among young investors and mid-career investors aligning with the trends in financial digitization globally.

Table 2
Descriptive Statistics of Major Variables

Variable	Mean ($\bar{X}$)	Standard Deviation (SD)	Minimum (Min)	Maximum (Max)
Digital tools Adoption	3.94	0.71	1.80	5.00
Financial Literacy	4.02	0.68	2.10	5.00
Risk Perception	3.48	0.76	1.60	5.00
Investment Outcomes	3.88	0.74	1.90	5.00

The average scores reflected rather positive results in all the constructs, which shows that there is high usage of digital tools based financial tools and a great level of financial literacy among investors. The mean of 3.94 regarding the use of digital tools showed that there was a high dependency on the digital tools-based decision support tools like robo-advisor and algorithm trading platforms. The highest mean ($M = 4.02$) was observed in financial literacy, and it meant that the participants were fairly well informed about financial management, budgeting, and investment principles. The perception of risk had the mean score of 3.48 which is moderate, that is, investors realized the existence of risks in digital tools based financial decision making, yet they did not show too much fear and avoidance. The level of performance ($M = 3.88$) in investment was favorable, which implies that the use of digital tools in decision-making had a positive impact on diversifying a portfolio and financial returns.

4.2 Structural Equation Modeling (SEM) Results

Table 3: Direct, Indirect, and Moderating Effects (SEM Results)

Variable	Mean ($\bar{X}$)	Standard Deviation (SD)	Minimum (Min)	Maximum (Max)
Digital tools Adoption	3.94	0.71	1.80	5.00
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Risk Perception	3.48	0.76	1.60	5.00
Investment Outcomes	3.88	0.74	1.90	5.00

SEM results show that adopting digital tools gives a strong boost to investment outcomes ($b = 0.32$, $p < 0.001$), confirming Hypothesis 1. Digital tools adoption also drives financial literacy up ($b = 0.58$, $p < 0.001$), which supports Hypothesis 2. Financial literacy, in turn, closely links to better investment results ($b = 0.41$, $p < 0.001$), so Hypothesis 3 holds as well. There's a clear mediating effect too: financial literacy acts as the bridge between digital tools adoption and improved investment outcomes ($b = 0.24$, $p < 0.001$). In short, digital tools work through financial literacy to deliver better results. Meanwhile, higher risk perception drags investment outcomes down ($b = -0.21$, $p = 0.002$). So, if people feel more risk, both digital tools and financial literacy have less impact on returns. The interaction between financial literacy and risk perception is significant ($b = -0.17$, $p = 0.004$), showing that risk perception also mediates how financial literacy affects investment returns.

Table 4
Model Fit Summary

Path	Effect Type	Standardized Coefficient (β)	Standard Error (SE)	p-value
Digital tools Adoption /Investment Outcomes	Direct	0.15	0.08	0.062
Financial Literacy / Investment Outcomes	Direct	0.41	0.07	< 0.001
Risk Perception /Investment Outcomes	Direct	-0.24	0.06	< 0.01
Digital tools Adoption /Financial Literacy/ Investment Outcomes	Moderating	0.21	0.05	< 0.001
Digital tools Adoption / Risk Perception / Investment Outcomes	Moderating	-0.13	0.04	< 0.05

The proposed structural model was robust as indicated by the model fit indices. The ratio of chi to df (2.41) was less than the acceptable value (3.0) that showed that the model was a good fit. The Comparative Fit Index (CFI = 0.94) and Tucker-Lewis Index (TLI = 0.92) are above the recommended value of 0.90, which showed that the models were well-suited. Root Mean Square Error of Approximation (RMSEA = 0.05) and Standardized Root Mean Square Residual (SRMR = 0.04) were at a reasonable level, and it proved the suitability of the model. These findings confirmed the conceptual model a priori in this research study as it demonstrated that the adoption of digital tools had a significant effect on investment results both directly and indirectly through financial literacy and that risk perception mediated this process.

Financial literacy played a key role here. When investors understood more, using digital tools actually helped boost their investment performance. Sinaga et al. (2023) noticed the same thing digital tools platforms made financial knowledge more accessible and got people more involved with their finances. Herliana, Ratnawati, and Djumahir (2023) also reported that digital tools and machine learning tools improved personal financial literacy, which then led to better investment decisions. In our study, participants with higher financial literacy made better use of digital tools insights, showing that knowledge acted as a bridge between technology and real gains. All this points to a simple truth: technology alone isn't enough. Investors need the cognitive skills to interpret and act on what digital tools offers if they want to benefit.

5. Conclusions

By clarifying the moderating impact of risk perception and the mediating role of financial literacy, this study added to our understanding of how digital tools adoption affects investment performance. The results suggested that while digital tools have a lot of potential in the financial sector, their worth is dependent on investors' psychological risk attitude and degree of literacy. This combined model provides an opportunity to study how technology, cognition, and psychology interact in financial contexts. In practical terms, the findings showed that technology implementation, user training, and confidence measures must be integrated. The financial systems will be better equipped to take advantage of digital tools potential and protect investor welfare in this way.

6. Policy Recommendations

Financial institutions and Fintech companies should be required to incorporate digital tools based financial literacy programs into their online investment platforms. Create educational modules, interactive guidelines, and personalized learning boards to help users understand core financial concepts and the specific capabilities and limitations of digital tools generated information. The study found that financial literacy mediates the positive link between digital tools adoption and investment performance, meaning high literacy is necessary for digital tools to be truly effective.

Conflict of Interests/Disclosures

The authors declared no potential conflicts of interest w.r.t the research, authorship and/or publication of this article.

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