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Decision-Making Perspectives on the Risks of Financial Digitalization Among Individual Respondents

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ABSTRACT

The rapid digitalisation of household finances has transformed the way individuals manage their financial activities, with online banking, mobile payments, investment platforms, and other digital financial services becoming an integral part of everyday life. While this transformation has increased accessibility and convenience, it has also introduced new challenges and risks related to data protection, cybersecurity, financial fraud, and volatile digital assets. Consequently, traditional financial knowledge related to saving, borrowing, and budgeting is no longer sufficient for effective decision-making in an increasingly digital financial environment. This study examines the relationship between digitalisation and digital financial literacy (DFL) across generations and educational levels, with particular emphasis on the perception of risks associated with financial crises and digital financial activities. The results indicate that digital financial literacy and the perception of crisis-related risks are closely associated with generational and educational factors, suggesting differences in individuals' ability to recognise and respond to risks in the digital financial environment. The study contributes to understanding the social implications of financial digitalisation and provides insights relevant to the development of strategies aimed at strengthening financial awareness and supporting more informed and effective financial decisions at both individual and household levels. Rather than examining the complete multidimensional construct of DFL, the study focuses specifically on the perception of risks associated with financial digitalisation. In this context, risk perception is considered an important dimension of DFL, reflecting individuals' awareness of and preparedness for emerging risks in the digital financial environment.

1. Introduction

The financial decisions made by individuals and households in both the physical and online spaces fundamentally determine their well-being in the present and the future. The increasingly rapid process of digitalisation over the past decade has affected all areas of finance. The financial decisions made by individuals and households in both the physical and online spheres fundamentally determine their current and future well-being. The rapid development of digitalisation over the past

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decade has also had an impact on everyday financial practices, requiring a new level of awareness and adaptation from consumers. According to research, the interpretation of financial behaviour and conscious consumer decisions is becoming increasingly complex, as other factors shape behaviour in the digital environment than in the traditional financial space [1]. At the same time, changes in the level of financial awareness and consumer habits show that certain groups react very differently to new financial solutions, which underlines the importance of targeted education [2]. Innovative methods aimed at improving the financial literacy of households prove that with adequate support and information, the soundness of decisions and financial stability can be significantly improved [3]. At the same time, the impact of cultural factors cannot be ignored: financial literacy is closely linked to values, attitudes, hereditary and social patterns, which can vary significantly from country to country and from generation to generation [4]. All this clearly shows that the world of financial decisions is no longer just an economic issue, but the result of the interplay of social, technological and cultural phenomena.

Automation and robotisation have also become dominant in the field of traditional financial products and services, overshadowing globally significant initiatives such as sustainability and social responsibility [5]. As a result of these processes, our everyday transactions – including financial ones – are increasingly taking place online, directing individuals towards products that appear simpler but are becoming increasingly complex in the background. All these processes put financial awareness, its practical applicability and importance even more in the spotlight. The concept of financial literacy and awareness began to be intensively studied in academia after the 2008 crisis, with a particular focus on the relationship between financial awareness and economic decision-making in financial decision-making [6–8]. Financial literacy in the classical sense has been expanded with a new perspective due to the pressure of digitalisation, giving rise to the concept of DFL, which consists of several dimensions: financial knowledge, communication, skills, behaviour and financial confidence [9], which are influenced by social and demographic factors (gender, age, education). It is important to emphasize that this study does not examine the full spectrum of DFL, but rather focuses specifically on the aspect related to the recognition and assessment of risks. The remainder of the study is structured as follows: the next chapter provides an overview of the relevant literature, followed by a description of the research methodology. I then present the empirical results, and the study concludes with a summary of the conclusions and practical implications.

2. Literature review

In recent years, a number of studies have examined the risks of financial digitalization and the role of DFL, providing further insight into the phenomenon under study. Recent research clearly showed that a combination of traditional financial knowledge and digital literacy plays a key role in protecting against new types of threats, such as identity theft and increasingly sophisticated forms of online fraud [10, 11]. At the same time, the literature also emphasized that technical competence alone is not sufficient: at the intersection of behavioral finance and digital regulation, it is clear that impulsive digital spending or the misinterpretation of complex online financial structures continues to pose a significant risk [12]. Consequently, the role of comprehensive approaches that treat financial literacy alongside digital security competencies—and are thus capable of supporting a more resilient economic environment—is becoming increasingly prominent [13, 14]. These efforts are also closely linked to the recognition that the level of DFL is not merely a theoretical issue but is directly related to the quality of everyday financial decisions, whether regarding saving, borrowing, or risk management [15, 16]. Rapid technological development creates new challenges, particularly regarding skills gaps, which is why advanced digital learning tools and initiatives based on public-private partnerships are playing an increasingly important role [17]. These are particularly important

in bridging the digital divide, as available data indicate that a lack of specific digital competencies still poses a significant barrier to accessing secure financial services [18]. More recent analyses also highlight that research findings are currently quite fragmented, both geographically and conceptually, particularly regarding the social and regulatory mechanisms that determine the relationship between DFL and fraud reduction [19]. This fragmentation also justifies future studies placing greater emphasis on the empirical evaluation of the effectiveness of targeted financial education programs, particularly in addressing new vulnerabilities arising from rapid technological adaptation [20]. It should also not be overlooked that distrust of digital financial services is often a systemic phenomenon, stemming in many cases from lower levels of digital literacy. This lack of trust poses a particular barrier for marginalized groups, as it deters them from using secure financial infrastructures [21].

In the age of digitalisation, it is essential that part of our finances is transferred to digital platforms. This process requires new knowledge and skills, which means that we need to consider a new level of financial awareness, namely DFL. Financial literacy (FL) is a specific combination of understanding, various skills and confidence that enables individuals to make sound and informed financial decisions. Early works on financial literacy [22] measured it by knowledge of basic concepts (interest, inflation, risk diversification). This requires an understanding of financial concepts and a level of financial knowledge that enables individuals to make responsible financial decisions. According to the OECD, financial literacy is a combined set of competencies that includes financial awareness, knowledge, skills, attitudes and behaviours necessary for sound financial decisions. A series of rational financial decisions leads to social well-being, which is due to this conscious decision-making [23]. Potrich *et al.* [24] distinguished two dimensions: knowledge and its application in relation to financial awareness, while others highlight three components: knowledge, financial attitude and conscious financial behaviour. Higher financial literacy is clearly positively related to an individual's financial well-being through more effective and rational financial decision-making [25, 26]. Higher FL increases financial satisfaction by facilitating effective wealth management and financial planning [27].

However, success in the digital financial environment requires not only access to technology, but also financial literacy and the skills necessary to use digital platforms safely [28]. Digital Financial Literacy is an extension of traditional financial literacy, encompassing the understanding, evaluation and conscious use of digital financial services. The emergence of the concept of DFL and the development of its importance were driven by advances in information technology and the spread of globalisation, which led to the rapid proliferation of financial products and services. The increased accessibility through digital platforms also places greater responsibility on individuals to maintain their financial well-being [29].

The conceptual basis of digital literacy was laid down by Gilster [30], who understood it as the ability to understand and use information from various sources. This was further developed by Bawden [31], who emphasised the technical skills needed to access, understand and share information. DFL thus does not merely refer to the transfer of traditional financial knowledge to the digital space but also presupposes a certain degree of system knowledge and system criticism [32]. Early definitions described DFL as the ability to use digital tools to make informed financial decisions, emphasising the importance of protection against digital financial risks [33]. However, more recent research has expanded this definition, emphasising the importance of knowledge, skills, attitudes and behaviours in the safe and effective use of digital financial services to promote financial well-being [34].

Fintech skills (such as digital application and software use) are also part of DFL, which manifests itself in the professional use of investment platforms, financial planning software, budgeting and

expense tracking applications [35]. An adequate level of DFL enables individuals to distinguish between reliable and false sources of information, recognise manipulated data, and thus protect themselves from fraud and misinformation [36]. DFL also deals with cyber security, recognising the risks of the online space and protecting against fraud, beyond the transfer of traditional knowledge [37]. Individuals with higher levels of DFL also enjoy greater financial well-being [38] than their peers with lower levels, where exposure to fraud and the likelihood of mental health problems may increase. A higher level of DFL increases the secure use of digital financial services (online banking, mobile payments), which, thanks to their efficiency, can be cost-effective solutions for their users [39]. At the same time, the digitisation of finance also has negative effects. Greater access to digital platforms increases the risk of fraud and data theft, as well as exposure to data security risks [40]. Perceived or actual DFL increases individual risk-taking and can even lead to excessive indebtedness through various innovative platforms [41]. DFL encompasses competencies such as using digital financial tools, accurately assessing online financial opportunities, protecting personal financial information, and making informed decisions in a rapidly changing financial technology environment [42]. According to the literature, the ability to recognize and interpret risks is a key component of DFL, as users in the digital environment must navigate increasingly complex technological and security risks. DFL has an impact on saving, investment and payment habits, as it enables individuals to use digital platforms effectively [43].

The identification of risks associated with financial digitalization is structured not only along technological lines but also along institutional and regulatory dimensions, which has a direct impact on individual and organizational decision-making [44]. Decision science approaches provided an effective framework for structuring individual risk perception in complex, technology-intensive environments, particularly when factor- and cluster-based analyses are applied [45]. Although we have been working on developing financial literacy for nearly 20 years, there are still shortcomings in many areas, even though technological financial skills can have a positive impact on both financial and general life satisfaction. Even greater gaps can be seen in DFL. There is also a lack of understanding of the risks posed by digitalisation, so its application to the financial sphere carries numerous risk factors. Cybersecurity risks, digital device use, online fraud, device vulnerability and regulatory gaps are all open questions about which most individuals still lack sufficient knowledge. It is also worth mentioning the misinformation surrounding cryptocurrencies, as many people consider them to be legal tender backed by state guarantees [46]. Among the indirect effects of digitalisation in financial terms are psychological adaptation and anxiety, which refer to anxiety related to financial decisions and stress arising from a lack of control, not to mention the growing phenomenon of financial exclusion [47]. Based on the above review of the literature, it can be concluded that, although digital financial literacy and its effects have been widely studied, less attention has been paid to the structured, empirical examination of risk perception across different social groups. In particular, there is a lack of analyses that simultaneously examine generational and educational differences in the context of the risk dimensions of financial digitalization. Since the beginning of the 21st century, the convergence of technology and finance has ushered in a new era in our daily lives, where digital financial services (mobile banking, online investments, fintech applications, digital wallets and cryptocurrencies) have become an integral part of our lives. These innovative solutions have redefined financial ecosystems, providing faster, more convenient transactions and striving for maximum user experience [48]. Thanks to this digital transformation, we are able to manage our finances conveniently and quickly, anywhere and anytime, without any social or geographical constraints [49]. Digital Financial Services (DFS) now cover a wide range of areas, from savings, investments, insurance and loans to online payments and transfers [50]. This change has redefined access to financial services, while also creating new challenges and risks.

The rise of digital financial services is remarkable worldwide. The proportion of these services varies widely, reaching as high as 90% in some places [51]. The emergence of digitalisation in finance on such a scale has an impact on the level of financial inclusion, on the one hand, and presents new challenges for financial decision-makers, on the other, as they have to navigate increasingly complex products and services. Individual decision-making in the digital environment presents decision-makers with increasingly complex challenges, as the volume, complexity, and opacity of information are growing significantly. Sahoo and Goswami [52] pointed out that modern decision-making situations can often be interpreted along multiple, competing criteria, which individuals evaluate not in a purely rational manner, but based on subjective weightings and perceived risks. In line with this, Thuy and Benoit [53] emphasized that the operation of digital systems—particularly solutions based on algorithms and artificial intelligence—is often not transparent to users, resulting in uncertainty and a lack of trust. Decisions are thus linked not merely to objective risks, but also to perceived uncertainty and the level of trust in the system, which fundamentally shapes individuals' decision-making behavior in the digital financial and technological environment. When viewed in the context of financial literacy, these processes also carry a number of risks, the escalation of which could increase the likelihood of financial crises. The spread of digital financial services has exacerbated the digital divide, which is particularly pronounced among the elderly, low-income groups and people with disabilities [54]. There are no barriers to digital financial services, and the number of companies and organisations offering services and financial opportunities in this market is growing rapidly, calling for stricter regulatory solutions across the entire product range [55]. The security of digital financial products is also questionable, but in addition to cyber security threats (online fraud, data theft, hacking), excessive expansion of resources can also cause financial instability [56]. For greater clarity, the most important findings from the literature are summarized in the table below (Table 1).

Table 1
Summary table of key reference works

Author(s)	Main Topic	Methodology	Key Finding
Lusardi & Mitchell [6]	The Importance of Financial Literacy	International survey, theoretical and empirical review	Financial literacy fundamentally influences financial decisions and well-being
Lusardi & Mitchell [22]	Financial Planning and Retirement	Empirical analysis	Financial literacy is strongly linked to long-term financial decisions
OECD [23]	Financial Literacy at the International Level	International survey	Significant differences can be observed in the financial awareness of the population
Potrich <i>et al.</i> [24]	A Model of Financial Literacy	Empirical model development	Financial literacy is a combination of knowledge, attitudes, and behavior
Garai-Fodor [2], Garai-Fodor & Huszák [1]	Conscious Consumer Behavior	Primary data collection	Awareness is closely linked to financial decisions and lifestyle
Sági <i>et al.</i> [3]	Financial Education	Case study (Hungary)	Targeted education improves households' financial decisions
Azeez & Akhtar [9]	Digital financial literacy	Empirical study	DFL levels are strongly influenced by demographic factors
Adiandari [10]	Digital society and financial literacy	Conceptual analysis	Financial literacy is key to managing digital risks
Aleksandrova <i>et al.</i> [11]	AI and digital financial decisions	Empirical study	Technological innovations generate new types of financial risks
Putri <i>et al.</i> [12]	Dimensions of digital financial literacy	Theoretical + empirical	Financial behavioral factors are key
Choung <i>et al.</i> [15]	DFL and financial well-being	Quantitative analysis	Higher DFL leads to better financial outcomes

Table 1
Continued

Author(s)	Main Topic	Methodology	Key Finding
Gumilar <i>et al.</i> [16]	DFL and financial inclusion	Systematic review	DFL facilitates access to financial systems
Koskelainen <i>et al.</i> [17]	The future of DFL	Research agenda	New competencies and educational models are needed
Sultana [18]	DFL and savings	Empirical study	Higher DFL increases formal financial savings
Andreou <i>et al.</i> [21]	Financial resilience	Empirical research	Financial literacy increases resilience
Lyons & Kass-Hanna [48]	DFL measurement frameworks	Methodological Overview	Digital financial literacy requires a complex, multidimensional measurement approach
Setiawan <i>et al.</i> [43]	DFL and financial behavior	Empirical Study	Digital financial literacy directly influences saving and spending patterns
Eichengreen [55]	Digital financial regulation	Theoretical Analysis	The platform economy creates new regulatory challenges for the financial system
Liu & Hou [56]	Cybersecurity and digital finance	Literature Review	Data protection and cybersecurity are critical in digital financial systems

Source: own compilation based on literature sources

Based on the above review of the literature, it can be concluded that, although digital financial literacy and its effects have been widely studied, less attention has been paid to the structured, empirical examination of risk perception across different social groups. In particular, there is a lack of analyses that simultaneously examine generational and educational differences in the context of the risk dimensions of financial digitalization.

3. Material and method

The aim of the research presented in this study was to quantitatively explore crises in the past, present and future. The research was conducted using a questionnaire survey with 1,109 participants, and data collection took place in the autumn of 2025 using the snowball method. In the snowball method, the core group consisted of university students who received and forwarded the questionnaire in the first round, and then the respondents they reached distributed it within their own networks, knowing that the survey would be used for scientific purposes. The involvement of respondents was completely open, with no exclusions or restrictions, and participation was voluntary and anonymous. Due to sampling limitations, the results cannot be considered representative, but the number of items and the multidimensional analytical approach can provide a reliable picture of the opinions of the various respondent groups. The questionnaire was structured to cover attitudes and experiences related to crises, with separate sections for opinions on past, present and future challenges. The questionnaire alternated between four-point rating scales, single-choice questions and association questions. The content validity of the questionnaire was ensured by expert pre-screening, and the questions contained therein were refined following a pilot test. The segmentation criteria included educational attainment and generational affiliation, which are variables suitable for group formation and difference analysis in the analysis.

Data protection and research ethics rules were enforced throughout the entire research process. Respondents were informed about the details of the research, including the purpose and legal basis of data processing, anonymity and the intended use of the data. The results were evaluated anonymously and in aggregate form. Only the researchers performing the analysis had access to the data files, and the data was stored in a secure environment. The reliability of the scales was assessed

using Cronbach's alpha. The first step in the analysis was to calculate the basic statistics: frequencies, means, and standard deviations. The statements in the survey were rated by respondents on a four-point Likert scale, where 1 meant complete disagreement and 4 meant complete agreement. The statements in the questionnaire primarily measure general perceptions of the systemic risks associated with financial digitalization, rather than individuals' personal perception of risk regarding their own exposure. The following statements were assessed during the study; in subsequent analyses, they are abbreviated and identified by the codes listed below (Table 2):

Table 2

The statements examined and their designation in the study

The digitization of financial services increases systemic risk.	systemic risk	DR-SYS
The speed of digital transactions can heighten market volatility.	volatility	DR-VOL
Digital financial systems are more vulnerable to cyberattacks.	cyber risk	DR-CYB
Digital financial systems are more vulnerable to technological failures.	technological failure	DR-TECH
Financial digitization reduces regulators' control over money flows.	regulatory control	DR-REGC
The spread of digital financial services may trigger new types of crises.	crisis risk	DR-CRIS
The speed of digital financial systems intensifies market reactions.	market reactions	DR-REACT
The transparency of digital transactions is not always guaranteed.	transparency	DR-TRANS
The spread of digital financial services increases financial risks.	financial risk	DR-FIN
Excessive automation of digital finance without human oversight can be dangerous.	automation	DR-AUTO
Technical failures in digital payment systems can cause economic disruptions.	operational disruption	DR-OPS
Financial digitization may displace traditional banking players.	displacement of players	DR-DISP
In addition to its benefits, financial digitization also poses significant regulatory challenges.	regulatory challenge	DR-REG

Source: own research, 2025, N = 1109

This was followed by intergroup difference tests using variance analysis. We performed factor analysis to group the factors examined. As a prerequisite, we examined the adequacy of the sample using the KMO indicator. We performed k-means cluster analysis to categorise the respondents. A significant limitation of the methodology is the non-random nature of snowball sampling, which may cause bias in terms of the characteristics of the social networks and willingness to participate. A further limitation is that self-reported attitudes may be sensitive to social expectations and current events. Another limitation is that DFL was not measured using a validated, multidimensional scale; therefore, the analysis approaches this construct through the lens of risk perception. We treated these transparently in the analysis, did not overgeneralise the results, and emphasised the specific characteristics of the sample in our interpretation. At the same time, the sample size of 1.109 respondents is a strength, as it allows us to project directions and trends. The composition of the sample is shown in Table 3.

Table 3

Distribution of respondents by educational attainment and generation (%)

Grouping criteria	Group	Distribution
Educational attainment	Elementary level (8th grade) or lower	5.59%
	Secondary level (vocational school, technical high school, high school)	56.81%
	Higher education – B.S. or college level	26.33%
	Higher education – M.S. or university level	11.27%

Table 3

Continued

Grouping criteria	Group	Distribution
Generational affiliation	Baby Boomer generation (1940–1964)	5.32%
	Generation X (1965–1979)	19.21%
	Generation Y (1980–1994)	20.02%
	Generation Z (1995–2007)	52.39%
	Generation Alpha (2008–)	3.07%

Source: own research, 2025, N = 1109

4. Results

The first step in evaluating the data was to check its reliability based on Cronbach's Alpha value. The indicator is 0.908, which indicates very high internal reliability. This means that the items on a given scale or questionnaire are strongly correlated with each other and consistently measure the items formulated in relation to the topic. In the research presented in this study, respondents were asked to evaluate statements related to digitalisation in finance using a four-point Likert scale based on average values. This paper examines the risks and impacts under review, from loss of control to the emergence of potential crises, based on basic statistical characteristics, which are summarised in Figure 1. When interpreting the results, it is important to note that the responses reflect general perceptions of digital financial systems rather than individuals' perceptions of risk based on their own experiences.

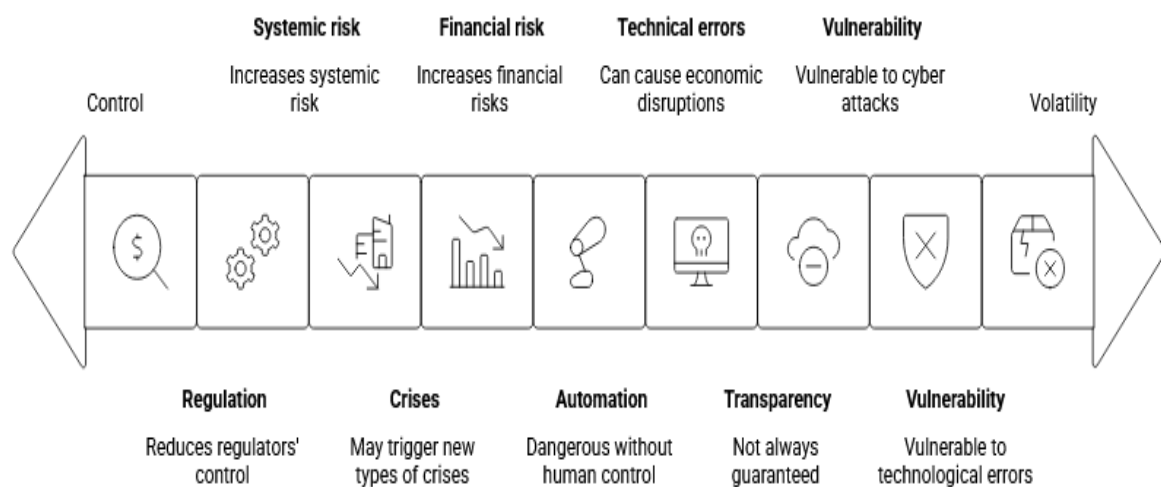


Fig. 1. The risk spectrum of digital finance

The overall assessment of the statements examined (Figure 2) can be described as moderately risk-focused, as the aggregate average was around 2.804, indicating that respondents view the risk dimensions of digitalisation with moderate concern. At the same time, the range of averages is relatively narrow, varying between approximately 2.557 and 2.973, suggesting that there are no statements that radically deviate from the general risk perception horizon. The average standard deviation is 1.125, reflecting a non-chaotic dispersion of opinions. The highest average value was given to the statement related to the excessive automation of digital finance, with a value of 2.973. This means that the respondents in the sample consider the lack of human control to be the most critical issue. In many cases, the transparency and oversight of automated decision support systems and machine learning models do not meet traditional banking risk management standards, which

increases the riskiness of digital finance. On the other hand, the complete or partial elimination of human intervention can result in the mismanagement of processes and certain unexpected events.

The lowest average value relates to the assessment of the correlation between the speed of digital transactions and market volatility, with a value of 2.557. This suggests that respondents see the increase in transaction speed as less of a factor in increasing volatility. Statements related to technological failures and cyber attacks also received the highest average scores. Technical failures in digital payment systems can cause economic disruption, with an average score of 2.904, while vulnerability to technological failures was rated at 2.897 and vulnerability to cyber attacks at 2.887. This clearly shows that respondents consider the operational and information security dimensions of digitalisation to be the most tangible risks, due to the ever-increasing complexity of systems, innovative technological solutions and the daily growth of cyber threats. The average score for the statement on transparency is 2.775, which indicates moderate concern. Respondents are likely to perceive the practical limitations of data and process transparency, expressing a lack of confidence in the system. The statement on regulatory control has an average score of 2.619, which shows that respondents are divided on the assessment of the weakening of control over financial flows. Regulatory technologies (RegTech) and data reporting obligations have been strengthened in many areas, although some players perceive the opposite to be true. Due to the nature of cross-border digital money movements, crypto assets and decentralised finance, many believe that regulators have been forced into a corner and that transparency and the ability to intervene in digital finance have actually decreased in certain areas. The digitisation of financial services increases systemic risk, with an average rating of 2.704. Statements that fit into the same logical chain, such as the possibility of new types of crises, were rated with an average of 2.757, and the increase in risk due to digital financial services was rated with an average of 2.807, which suggests increased caution on the part of respondents. The threat of traditional banking players being squeezed out received an average rating of 2.782, indicating that although the rise of new players, fintech companies and platforms is noticeable, respondents do not generally expect traditional institutions to be spectacularly squeezed out of the financial landscape. The statement on regulatory challenges received an average score of 2.895, placing it at the top of the range of statements, which indicates that respondents believe that digitalisation brings challenges as well as benefits (Table 4).

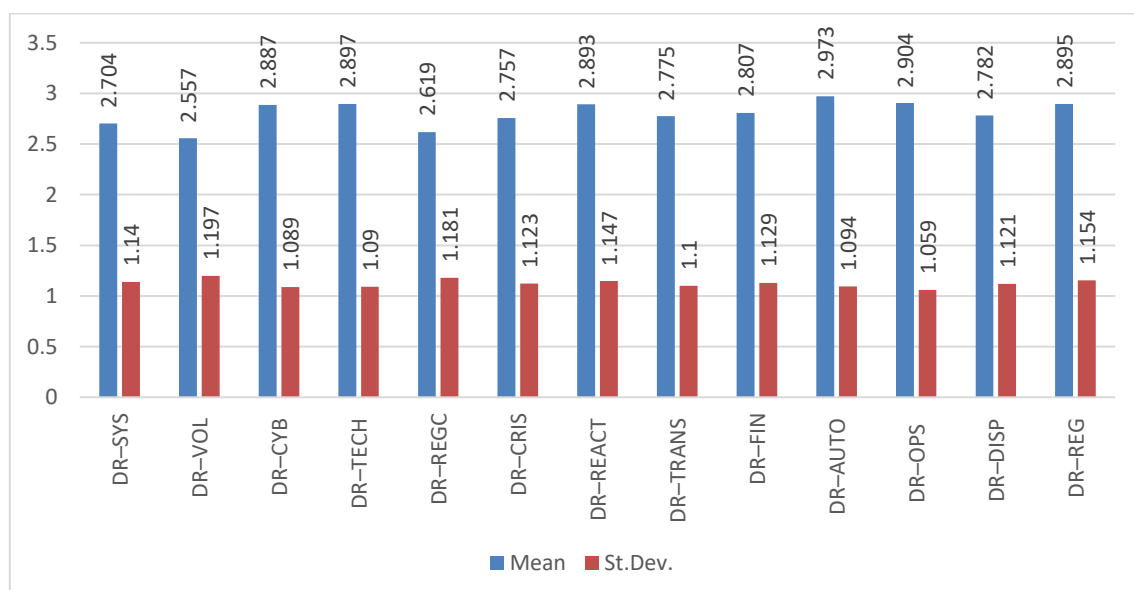


Fig 2. Assessment of statements on the effects of financial digitalisation based on averages and standard deviations

In the following, we interpret the factors examined according to the respondents' educational attainment (Figure 2.). For respondents with basic education, the group average is lower (2.377). The highest values focus on the expansion of automation without human control (2.645), the lack of transparency in transactions (2.597) and the economic consequences of technical errors in payment systems (2.500). This suggests that respondents mainly perceive operational-level, directly observable risks as significant, while they tend to be more cautious about system-level and macro-level risks, based on their experience and knowledge. At the bottom of their list are the possibility of new types of crises (2.113), transaction speeds that increase volatility (2.242) and a decline in regulatory control (2.242), which confirms the previous assumption. It can also be observed that respondents with the lowest level of education.

The group with secondary education is noticeably risk-focused, as evidenced by the group average of 2.847, which exceeds the previous group's result by 0.5 and is the highest in all segments. The highest average scores were given to the economic disruption caused by technical failures (2.986), the uncontrolled dangers of automation (2.962) and the regulatory challenges associated with digitalisation (2.943). Cyber vulnerability (2.894), the speed of market reactions (2.897) and the increase in financial risks (2.875) also received high scores, indicating a particularly cautious approach. Respondents with secondary education showed the highest average scores across segments in several cases, namely technical failures, increased financial risks, regulatory issues and the spread of future crises. The group with higher education (BSc) focused on technological aspects. The group average is 2.805, with the highest values related to the speed of market reactions (2.986), control-related risks (2.983) and vulnerability to cyber attacks (2.976). This trio clearly indicates that respondents are aware of the technological tensions inherent in digitalised infrastructures and the seriousness of information security threats. The role of human control is particularly emphasised in the assessment of the group with higher education and master's degrees. The group average is 2.797, but the highest values in the entire sample are found here: the danger of automation without human supervision stands at 3.168. The next highest values are related to the vulnerability of technological failures (2.984) and the speed of market reactions (2.968), which are also the highest in the entire sample. Systemic risk and the reduction of regulatory control are at a medium level (2.752 in both cases), which is also outstanding in relation to the entire sample. It can be said that this group is the one that, due to its education and prior knowledge, views the financial risks arising from digitalisation most critically and decisively (Table 4).

Table 4

Opinions on the effects of financial digitalisation in groups classified by educational attainment

	Primary	Secondary	Tertiary – BSc	Tertiary -MSc
DR-SYS	2.290	2.756	2.661	2.752
DR-VOL	2.242	2.624	2.640	2.184
DR-CYB	2.435	2.894	2.976	2.872
DR-TECH	2.452	2.933	2.877	2.984
DR-REGC	2.242	2.654	2.568	2.752
DR-CRIS	2.113	2.825	2.733	2.784
DR-REACT	2.258	2.897	2.986	2.968
DR-TRANS	2.597	2.832	2.726	2.688
DR-FIN	2.403	2.875	2.767	2.760
DR-AUTO	2.645	2.962	2.983	3.168
DR-OPS	2,500	2.986	2.829	2.872
DR-DISP	2.435	2.832	2.812	2.632
DR-REG	2.290	2.943	2.901	2.944

Source: own research, 2025, N = 1109

Similar interesting patterns can be seen in the respondents' opinions when grouped by generation (Figure 3). The average rating for Generation BB is more restrained, with a group average of only 2.510. They are most aware of the risks arising from technological failures: they rate the vulnerability of digital systems to technological failures highly (2.881), and similarly rank the economic impact of technical failures in payment systems (2.847) in first place. They also consider the expansion of automation without human control to be a major threat (2.763). In general, it can be seen that in their case, the lowest averages were obtained in several cases at the level of the entire sample, which is due to the generation's distance from digital finance and their preference for traditional banking and financial products and services.

Generation X is the most risk-sensitive profile, with a group average of 2.880, which is by far the highest of all generations. They give the highest values in several areas: the danger of automation without human control is highest among them (3.075), and the speed of market reactions to " " (3.052) and the assessment of regulatory challenges (3.052) are also outstanding in their case. They also perceive the cyber and technological vulnerability of digital finance very strongly (3.042 and 3.019), and the impact of technical failures in payment systems is also high (2.939) in their case. Generation Y rated the 13 statements with an average score of 2.788, which is considered medium-high for the entire sample. They have the highest perception of a decline in regulatory control (2.716) and rate the risk of uncontrolled automation (2.977) and regulatory challenges (2.914) relatively high. They give consistently high scores in the cyber and technical dimensions, which indicates a slightly more optimistic attitude towards risk factors. Generation Y is closer in age to Generation Z, they are also more comfortable in the online space, and have sufficient knowledge and maturity regarding online life compared to their older peers, which is why their risk sensitivity is also lower. Generation Z's average rating is 2.818, which is surprisingly the second highest value for the entire sample. Respondents are most concerned about the risk of automation (2.962), but the assessment of cyber vulnerability (2.910) and the impact of technical failures in payment systems (2.909) is also high. Surprisingly, they rated the risk of new types of crises the highest (2.797), which means that perhaps due to their participation in the education system or their recent graduation, they are most familiar with the mechanisms and functioning of crises and bubbles. It is surprising that Generation Z, often referred to as the "always online" generation, tends to rate the risks of financial digitalisation more highly than other generations. Generation Alpha's average rating of financial digitalisation is 2.699, and despite their young age, they have formed surprising opinions in two areas: they have the highest assessment of the increase in financial risks (3.059) and the highest perception of transparency deficiencies (2.912). The perceived risk of uncontrolled automation is high (2.853), and the speed of market reactions and the impact of technical errors in payment systems are also strong (both 2.824). Members of the alpha generation also benefit from convenience and online life, yet they are critical of the risks of financial digitalisation, which has a positive impact on their digital financial literacy (Table 5).

After analysing the descriptive statistics of the variance analysis, it is also worth examining whether the respondents' educational attainment or generational affiliation has an impact on their assessment of the digitalisation of finance. Based on the level of significance, it can be said that educational attainment can significantly influence a number of factors, unlike generational affiliation, which only has a significant influence on four factors. This was already suggested by previous analyses, as more pronounced differences were observed in terms of educational attainment (Table 6).

Table 5

Opinions on the effects of financial digitalisation in groups formed on the basis of generational affiliation

	BB	X	Y	Z	ALPHA
DR-SYS	2.390	2.850	2.658	2.709	2.559
DR-VOL	1.847	2.498	2.568	2.656	2.412
DR-CYB	2.559	3.042	2.806	2.910	2.618
DR-TECH	2.881	3.019	2.847	2.893	2.559
DR-REGC	2.288	2.573	2.716	2.647	2.382
DR-CRIS	2.508	2.793	2.707	2.797	2.588
DR-REACT	2.339	3.052	2.878	2.900	2.824
DR-TRANS	2.644	2.746	2.748	2.800	2.912
DR-FIN	2.373	2.887	2.734	2.835	3.059
DR-AUTO	2.763	3.075	2.977	2.962	2.853
DR-OPS	2.847	2.939	2.887	2.909	2.824
DR-DISP	2.559	2.920	2.802	2.744	2.824
DR-REG	2.627	3.052	2.914	2.871	2.676

Source: own research, 2025, N = 1109

Table 6

The influence of educational level and generational affiliation on the assessment of the effects and risks of financial digitalisation

	Level of education	Generational affiliation
DR-SYS	0.018	0.064
DR-VOL	0,000	0,000
DR-CYB	0.005	0.010
DR-TECH	0.007	0.17
DR-REGC	0.029	0.086
DR-CRIS	0,000	0.282
DR-REACT	0,000	0.001
DR-TRANS	0.198	0.746
DR-FIN	0.013	0.012
DR-AUTO	0.022	0.342
DR-OPS	0.002	0.956
DR-DISP	0.022	0.174
DR-REG	0,000	0.071

Source: own research, One-Way ANOVA, sig < 0.05, 2025, N = 1109

The statements examined and analysed above are grouped using factor analysis. The factors make it easier to see the groups of ideas that are relevant in the respondents' assessment of financial digitalisation. The Kaiser-Meyer-Olkin (KMO) value of 0.942 indicates extremely high sample adequacy. The KMO value measures how suitable the data are for factor analysis, i.e. how strong the correlations between the variables are for the formation of the factor structure. The main factor groups are shown in Figure 2.

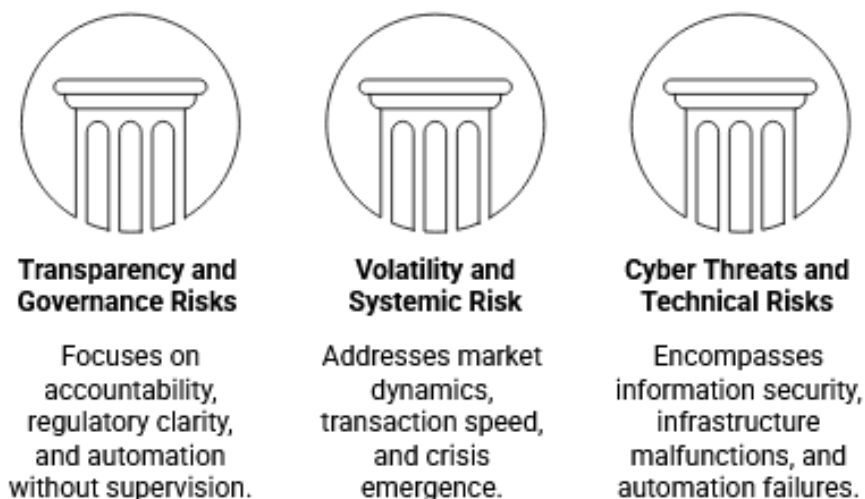


Fig. 2. Factor groups based on research

The factor analysis performed to group the statements related to financial digitalisation classified the assessed risks into three groups (Table 7), which are as follows:

i. Transparency and governance risks:

This factor includes factors affecting accountability, transparency and the clarity of market structures. Transaction transparency, challenges related to regulatory frameworks, and the expansion of automation without human supervision are included here, which may pose a threat to traditional banking players. Factors that can cause a technical or operational error to quickly turn into a financial and reputational problem were included in this factor.

Table 7

Factors associated with the digitalisation of finance (Varimax, KMO = 0.942)

	Transparency and governance risks	Volatility and systemic risk	Cyber threats and technical risk
DR-DISP	0.738	0.255	0.031
DR-TRANS	0.640	0.164	0.317
DR-OPS	0.637	0.157	0.371
DR-REG	0.613	0.325	0.269
DR-AUTO	0.575	0.089	0.505
DR-FIN	0.549	0.488	0.213
DR-REACT	0.496	0.466	0.225
DR-VOL	0.132	0.767	0.211
DR-REGC	0.374	0.691	0.094
DR-SYS	0.130	0.678	0.428
DR-CRIS	0.527	0.575	0.132
DR-CYB	0.197	0.270	0.789
DR-TECH	0.288	0.249	0.742

Source: own research, 2025, N = 1109

ii. Volatility and systemic risk:

This factor captures the consequences of market dynamics and network connectivity. This includes the risk arising from transaction speed, the acceleration of market reactions, and the emergence of new types of crises. This factor concerns how the market mechanism, accelerated by digitalisation, can convert local stimuli into systemic bubbles or even crises.

iii. Cyber threats and technical risks:

This factor group includes information security attacks and infrastructure malfunctions. The key elements of this group are vulnerability to cyber attacks, technological failures, payment system outages or performance degradation, and the operation of automation without human control, which can also have knock-on effects in the area of digital finance. The difference compared to the previous factors is that here the risk is primarily technical in nature, but at the same time, due to network connectivity, it can have a systemic impact in a very short time, inducing disruptions and crises.

Following factor analysis, cluster analysis was used to identify personas related to the digitalisation of finance. We identified respondents based on the underlying dimensions revealed by factor analysis to see how they grouped along the factors. The following three groups emerged based on the above (Figures 2 and 3):

The clusters have the following characteristics:

iv. Institutional sceptics:

This cluster is particularly sensitive to governance, oversight and transparency risks. Respondents in this cluster feel that digitalisation poses a challenge to regulation and control, institutional stability and transparency. However, they do not perceive market volatility and systemic risk as particularly significant, and they rate cyber/technical vulnerability as particularly low. This cluster comprises 28.22% of respondents.

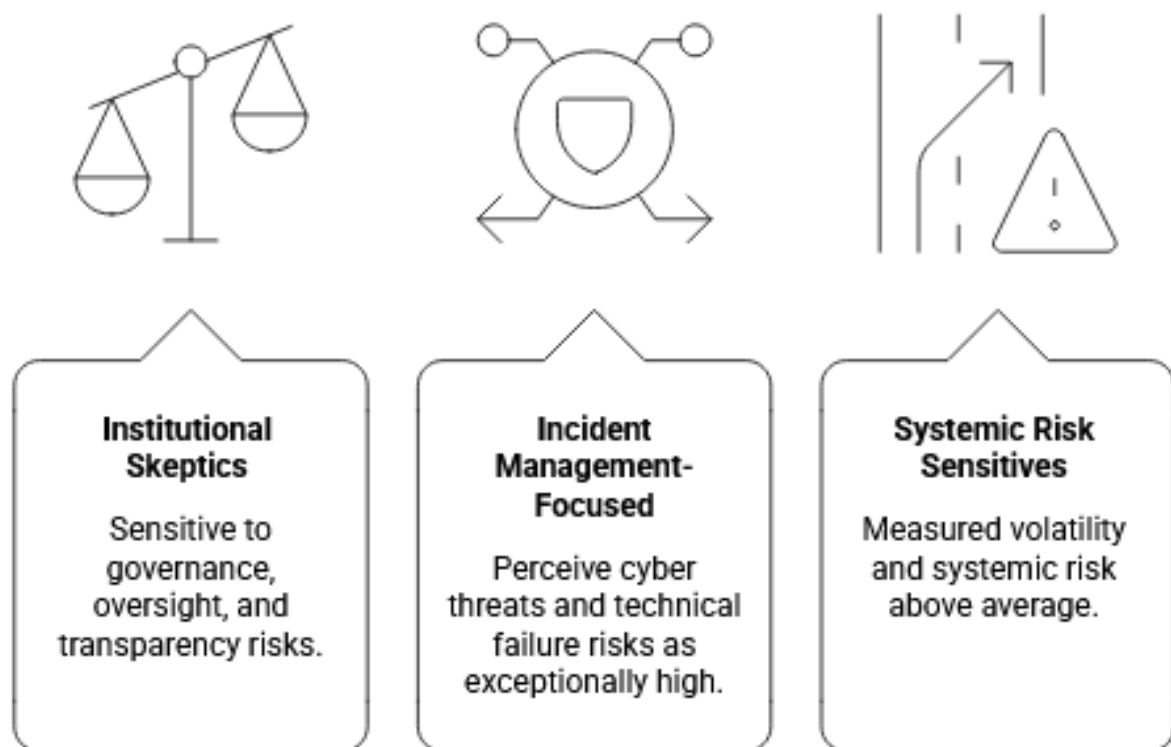


Fig. 3. Personas based on the risks of financial digitalisation and their characteristics

v. Incident management-focused

Respondents in this group perceive cyber threats and technical failure risks as particularly high, with the fragility of digital infrastructure, incidents, outages and data security issues being the main problems for them. In contrast, they perceive market volatility and systemic risk as very low, and

consider the governance dimension to be only slightly above average. Relatively few respondents, only 15.06%, belong to this group.

vi. System risk sensitive

This cluster measured volatility and systemic risk above average, visualising amplified market reactions and the possibility of new types of crises due to the speed, interconnectedness and automation of digital finance. The cyber dimension was rated as average and governance risks as low. This group proved to be the most extensive, as it included 56.72% of respondents.

Based on the results of the cluster analysis, the sample can be divided into three distinct groups. More than half of the respondents (629 people) belong to the “System-risk-sensitive” cluster, which accounts for 56.72% of the total sample. This group is therefore dominant and suggests that the majority of respondents are primarily sensitive to the systemic risks of financial digitization. The Institutional skeptics cluster comprises 313 people, accounting for 28.22% of the sample. This group has a moderate presence and reflects a critical attitude toward issues of institutional control and regulation. The smallest cluster is the Incident-management-focused cluster, comprising 167 individuals, representing 15.06% of the sample. Overall, the distribution is balanced; however, a pronounced perception of system-level risks is clearly dominant in the sample (Table 8).

Table 8
Clusters and cluster centers

	Institutional skeptics	Incident- management- focused	System-risk- sensitive
Transparency and governance risks	0,767	0,165	-0,426
Volatility and systemic risk	-0,062	-1,334	0,385
Cyber threats and technical risk	-0,698	1,102	0,055

Source: own research, 2025, N = 1109

The table shows the proportion of respondents belonging to each cluster by educational attainment level, as well as the values of the adjusted standardized residuals, which indicate significant deviations from the mean. At every educational level, the System-risk-sensitive cluster dominates, with a proportion ranging from 55.9% to 62.9%, suggesting that the perception of systemic risks is a generally dominant attitude, regardless of educational attainment. The Institutional skeptics cluster appears in particularly high proportions among those with a secondary education (30.3%), although the residual value (1.8) does not indicate a significant difference. In the case of the Incident-management-focused cluster, the group with a higher education MSc degree stands out: here, not only is the proportion higher (21.6%), but the adjusted standardized residual also exceeds the critical value of 2 (2.2), indicating significant overrepresentation. This suggests that the incident-oriented, operational risk approach is more strongly associated with higher educational attainment. Based on the residuals, a single marked difference can be identified: the Incident-management-focused cluster is overrepresented among those with a master’s degree (MSc) (21.6%), which is also confirmed by the adjusted residual of 2.2. This suggests that an attitude focused on incident management is more likely than average to appear in this educational attainment group. For the other cluster–educational attainment combinations, the absolute values of the residuals do not reach the threshold of 2, so we cannot speak of a statistically relevant difference in these cases. Based on the significance level of 0.155 for the Pearson χ^2 test, it can be concluded that no statistically significant relationship exists between educational attainment and cluster membership; that is, the differences can be attributed to chance (Table 9).

Table 9

Distribution of risk attitude clusters and their adjusted standardized residuals by educational level

		Primary	Secondary	Tertiary – BSc	Tertiary -MSc
Distribution	Institutional skeptics	19,35%	30,32%	28,08%	22,40%
	Incident-management-focused	17,74%	13,81%	14,38%	21,60%
	System-risk-sensitive	62,90%	55,87%	57,53%	56,00%
Adjusted standardized residual	Institutional skeptics	-1,6	1,8	-0,1	-1,5
	Incident-management-focused	0,6	-1,3	-0,4	2,2
	System-risk-sensitive	1,0	-0,7	0,3	-0,2

Source: own research, 2025, N = 1109

When broken down by generation, the cluster distributions present a relatively balanced picture, though clear differences in emphasis can be identified. In every generation, the System-risk-sensitive cluster dominates, with a share ranging from 49% to 58%, indicating that sensitivity to systemic risks of financial digitalization is a defining attitude regardless of generation. The Institutional skeptics cluster appears in higher proportions particularly among Generations Y and Alpha (31.08% and 35.29%, respectively), which may indicate a more critical attitude toward institutional frameworks and regulation. In the case of the Incident-management-focused cluster, Generation BB stands out, with a proportion reaching 25.42%, while this figure is significantly lower among Generation Y. Based on the above patterns, it can be said that the incident-oriented risk perspective is more closely associated with older generations, while institutional criticism receives greater emphasis among younger groups.

Based on the adjusted standardized residuals, no strong, statistically significant differences in cluster membership are observed in the majority of generational groups; however, two cases are particularly noteworthy. The Incident-management-focused cluster is significantly overrepresented in the BB generation, as supported by the adjR value of 2.3. This suggests that in this group, an attitude focused on incident management and operational risks is more likely to appear than expected. In contrast, the same cluster is underrepresented in Generation Y, where the residual reaches a value of –2.0, which also indicates a relevant difference. In the other cluster–generation combinations, the absolute value of the residuals remains below 2, so these differences cannot be considered statistically significant. The Pearson chi-square significance level of 0.123 calculated for generational affiliation suggests that the correlation between generations and cluster membership cannot be considered statistically significant, so the observed differences are primarily descriptive in nature, meaning they do not exceed the level of random variation here either (Table 10).

Table 10

Distribution of risk attitude clusters and their adjusted standardized residuals by generational affiliation

		BB	X	Y	Z	ALPHA
Distribution	Institutional skeptics	25,42%	23,47%	31,08%	28,74%	35,29%
	Incident-management-focused	25,42%	18,31%	10,81%	14,46%	14,71%
	System-risk-sensitive	49,15%	58,22%	58,11%	56,80%	50,00%
Adjusted standardized residual	Institutional skeptics	-0,5	-1,7	1,1	0,4	0,9
	Incident-management-focused	2,3	1,5	-2,0	-0,6	-0,1
	System-risk-sensitive	-1,2	0,5	0,5	0,1	-0,8

Source: own research, 2025, N = 1109

5. Conclusions

The digitalisation of finance is no longer just a technological development, but is fundamentally transforming the elements of financial literacy and the risk structure: it brings new governance and transparency challenges, increases systemic interconnectedness and volatility, and significantly

increases cybersecurity and technical vulnerabilities, requiring a complex and differentiated approach to risk management. All these factors, both individually and in combination, represent a significant level of risk, increasing the likelihood of crises originating in the financial system. Given the above factors, there is no question about the importance of strengthening DFL, especially in areas influenced by artificial intelligence. This study has explored risk perceptions related to financial digitalisation in several dimensions, which are valid today, i.e. in 2025, and which may change significantly in a few years or even a few months. It is important to note, however, that the results do not provide a comprehensive assessment of DFL, but rather offer insight into its risk perception dimension. Based on the average values given for each factor, respondents perceived moderate but not negligible risks overall. The highest average value was associated with the expansion of automation without human control, indicating that responsibility and oversight issues are the most critical in relation to the digitalisation of finance. The breakdown by educational attainment showed that lower-educated groups tend to focus on direct, technical and transparency issues, while higher-educated groups (especially those with an MSc degree) perceived the lack of human control and complex system-level risks more strongly. The assessment by generation also showed a differentiated picture. Generation X proved to be the most risk-sensitive, followed, surprisingly, by members of Generation Z. Factor and cluster analysis were used to identify the personas that are worth addressing in the field of digital financial decisions for the sake of communication and process security. One of the main limitations of the study is the non-representative sampling, which stems from the snowball sampling method; consequently, the generalizability of the results is limited. In addition, the study measures self-reported attitudes, which may be influenced by current events and social expectations. The research highlighted that the risks of financial digitalisation are multidimensional and that perceptions are strongly dependent on education and generational background, although a direct effect cannot be demonstrated in all cases. However, the study did not address individual-level risk perception or behavioral responses; thus, the results primarily reflect general attitudes toward digital financial systems. For this reason, risk management strategies must take a differentiated approach: strengthening governance and regulatory frameworks, developing technological resilience, and introducing macroprudential controls to ensure systemic stability, systemic security and reduce the likelihood of future crises. An important direction for future research could be the examination of individual risk perception and actual behavioral patterns, as well as the use of validated digital financial literacy assessment tools. An important direction for future research could be the examination of individual-level risk perception and behavioral responses, as well as the use of longer-term, longitudinal analyses to track changes in attitudes toward digital finance.

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Conflicts of Interest

The authors declare no conflicts of interest.

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