Computers in Human Behavior Reports 18 (2025) 100687

Contents lists available at ScienceDirect

Computers in Human Behavior Reports

journal homepage: www.sciencedirect.com/journal/computers-in-human-behavior-reports

Decentralized fintech platforms adoption intention in cyber risk environment among GenZ: A dual-method approach using PLS-SEM and necessary condition analysis

Md Sharif Hassan [a], Nguyen Hong Mai [b], Nor Shaipah Abdul Wahab [a], Mohammad Bin Amin [c,h,i,*], Md Maruf Hassan [d], Judit Oláh [e,f,g]

[a] School of Accounting and Finance, Taylor's University, Subang Jaya 47500, Malaysia
[b] Faculty of Business Administration, Van Lang University, Ho Chi Minh City, Vietnam
[c] Doctoral School of Management and Business, Faculty of Economics and Business, University of Debrecen, Böszörményi street 138, 4032 Debrecen, Hungary
[d] Department of Computer Science & Engineering, Southeast University, Dhaka, 1208, Bangladesh
[e] Faculty of Economics and Business, University of Debrecen, Böszörményi street 138, 4032 Debrecen, Hungary
[f] Doctoral School of Management and Business Administration, John von Neumann University, 6000, Kecskemét, Hungary
[g] Department of Trade and Finance, Faculty of Economics and Management, Czech University of Life Sciences Prague, Czech Republic
[h] Department of Business Administration, Faculty of Business Studies, Bangladesh Army University of Science and Technology, Saidpur 5310, Nilphamari, Rangpur, Bangladesh
[i] Department of Business Studies, State University of Bangladesh, Dhaka, Bangladesh

ARTICLE INFO

Keywords:
Digital literacy
Perceived security
Risk tolerance
Trust in technology
Social influence

ABSTRACT

Decentralized fintech platforms (DFP) emerge as a viable alternative to the traditional financial systems. However, the cybersecurity risk impedes its widespread adoption among the users. So, this paper aimed to investigate the drivers that influence the decentralized fintech platforms adoption intention in the cyber risk environment. The study integrated two dominant theories including Technology acceptance model and Trust theory to develop the research framework. A survey questionnaire was developed and distributed among Generation Z who are studying in different universities in Klang Valley Malaysia. A total of 391 valid responses were received. The data were analyzed through partial least squares structural equation modeling (PLS-SEM) and necessary condition analysis (NCA). Findings indicate that digital literacy (DL), perceived security (PS), social influence (SI), risk tolerance (RT), and trust in technology (T) significantly affects Generation Z users' intention to adopt decentralized fintech platforms. Additionally, trust in technology partially mediates the relationship between risk tolerance and DFP adoption intention. However, NCA analysis showed that perceived security, social influence, risk tolerance, and trust in technology are the necessary conditions for users' DFP adoption intention. This study contributes to both theory and practice by offering a comprehensive model for understanding cybersecurity perceptions in decentralized fintech adoption in cyber risk environment. It provides valuable insights for academics exploring DFP user behavior in emerging markets and highlights the role of trust in technology in shaping adoption intention decisions. The findings also underscore both opportunities and challenges for its adoption. Key opportunities lie in leveraging peer-driven influence and platform trust to engage Gen Z, while challenges include addressing persistent cybersecurity concerns through transparent design, targeted education, and inclusive regulation. Ensuring widespread adoption will require coordinated efforts between developers, policymakers, and educators to foster both confidence and digital resilience in this emerging financial paradigm.

* Corresponding author. Doctoral School of Management and Business, Faculty of Economics and Business, University of Debrecen, Böszörményi street 138, 4032 Debrecen, Hungary.
E-mail addresses: mdsharifhassan27@gmail.com (M.S. Hassan), mai.nh@vlu.edu.vn (N.H. Mai), norshaipah.abdulwahab@taylors.edu.my (N.S.A. Wahab), binamindu@gmail.com (M.B. Amin), ancssf@gmail.com (M.M. Hassan), olah.judit@econ.unideb.hu (J. Oláh).

https://doi.org/10.1016/j.chbr.2025.100687
Received 10 February 2025; Received in revised form 6 May 2025; Accepted 8 May 2025
Available online 10 May 2025
2451-9588/© 2025 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

1. Introduction

Decentralized finance is a major transformation of the financial sector in which decentralized goods are provided as traditional economic functions rendered via blockchain to create an open-source, permissionless, and transparent monetary ecosystem that can operate without the need for trusted intermediaries (Harvey & Rabetti, 2024; Makarov & Schoar, 2022; Xu et al., 2024). Decentralized finance is disrupting traditional centralized finance, as international peer-to-peer services give users more sovereignty and control over their assets. This change offers the potential to democratize finance and stimulate innovation.

The cyber risks are significant, yet decentralized finance remains a promising vehicle for change. The complexity of blockchain technologies and uncertainty in security and trust make it a significant barrier to usage (Javaheri et al., 2024; Trianto et al., 2023). Many users are discouraged by the technical aspects and still perceive decentralized platforms as having excessive cyber risks. Moreover, differences in digital literacy and degrees of risk appetite among users further weaken confidence in decentralized finance solutions (Mohd Nor et al., 2021; Nilashi et al., 2024; Yeong et al., 2022). As decentralized fintech platforms are changing the face of finance, they present new opportunities and substantial cybersecurity threats that will be particularly important to the GenZ user. Cybersecurity recommendations by trusted peers can reduce doubts and provide supportive conditions for using decentralized fintech platforms (Alshater et al., 2021; Ramly & Md Zabri, 2024). On the other hand, adoption may be hampered by skepticism or negative attitudes within one's social network (Yathiraju & Dash, 2023). Trustworthiness through social channels magnifies the need for decentralized fintech platforms to engage transparently with their communities to build collective confidence (Yathiraju & Dash, 2023).

Decentralized finance is more than just a form of technological innovation. It is also a force that propels the socio-economic transformation of a global nature. Makarov and Schoar (2022) study related to decentralized finance disrupting traditional financial systems, stating that it allows users to receive a wide range of financial services without intermediaries, positively affecting inclusion and independence. However, the very nature of the transformation raises both exciting possibilities and enormous challenges, one of which comes in the form of cyber security, now recognized as perhaps its greatest roadblock (Javaheri et al., 2024). In regions like Southeast Asia with fragmented regulatory frameworks, differing levels of digital literacy and culturally-influenced risk tolerance only add complexities to adoption (Trianto et al., 2023). Understanding the interplay of security perceptions, trust, and risk tolerance in shaping user behavior is essential to building trust in decentralized finance platforms and achieving widespread adoption.

Security remains a critical barrier to broader decentralized fintech platform acceptance, particularly among Gen Z users who are both digitally native and acutely aware of cybersecurity vulnerabilities. The decentralized nature of these platforms exposes users to heightened risks, including the irrevocable loss of assets through mismanaged private keys, targeted cyberattacks on decentralized exchanges (DEXs), and systemic threats stemming from unregulated stablecoins (OECD, 2024). High-profile breaches, such as the USD 540 million exploit of the Ronin Bridge, starkly illustrate the scale of potential financial losses. Overcoming these challenges will require not only ongoing innovation in user experience design but also substantial improvements in cyber resilience across decentralized fintech infrastructures.

Trust, a critical driver for user adoption of decentralized fintech ecosystems, is directly governed by the perceived security (Ahmed et al., 2024). The studies underscore the rule that when users have confidence that decentralized fintech platforms are stable (with the best encryption, sensible contract audits, and clear protocols), they tend to use such services (Al-Adaileh et al., 2024; Proelss et al., 2023). Technological advancements and effective communication are required to alleviate perceived risks due to security concerns, which can, in turn, aid user adoption (Shao et al., 2022; Song et al., 2022).

Moreover, research on financial behaviors and fintech adoption in developing economies like Malaysia remains sparse. Studies on digital wallet adoption have primarily focused on gamification and e-wallet technologies (Yathiraju & Dash, 2023), while the intention to adopt decentralized fintech platforms (BI) has received limited attention. This gap is particularly noticeable in the context of understanding how users' trust in technology mediates their risk tolerance and influences their intention to adopt decentralized platforms. So, this study contributes to the literature through the theoretical framework proposed in this study and offers valuable insights for academics to explore the intention to adopt decentralized fintech platforms while considering cybersecurity perceptions in an emerging market. Additionally, the study included trust in technology as a mediating variable between risk tolerance and intention to use, which adds new insights into the literature on the adoption intention of decentralized fintech platforms.

Digital literacy is the underpinning of proper engagement with decentralized systems, meaning users must understand their way around technical details related to blockchain technologies. Previous studies reflect on the importance of not just surface-level technological know-how as literacy in this digital age, but with an additional component where individuals also understand deeper processes such as smart contracts (Xu et al., 2024). Also, social influence accelerates adoption, and peer recommendations increase user trust while decreasing the risks users perceive in new technologies (Yeong et al., 2022). However, the absence of centralized control within DeFi ecosystems makes users even more skeptical, necessitating platforms to create clear communication plans and focused interventions.

In Malaysia, the adoption of decentralized fintech platforms is steadily gaining momentum in parallel with the country's broader fintech expansion. As of 2024, the sector encompassed approximately 286 active companies, with about 25 of these focused specifically on blockchain-related services, making up roughly 8.7 % of the industry (Fintech News Malaysia, 2024). Malaysia's global standing ranked 57th for overall DeFi value and 45th for retail DeFi value when adjusted for GDP per capita (Chainalysis, 2024), signals a growing but still maturing decentralized finance ecosystem. The rise of alternative financing avenues, particularly peer-to-peer (P2P) lending, which increased by 20 % to RM2.51 billion in 2024, reflects an increasing appetite for decentralized financial solutions (Securities Commission Malaysia, 2024).

Within this landscape, Klang Valley, encompassing Kuala Lumpur and Selangor, has emerged as Malaysia's most served by P2P financing in 2024 at 52 % (Securities Commission Malaysia, 2024). The region benefits from one of the highest internet penetration rates in the country and has a digitally fluent, entrepreneurial population. Regulatory initiatives, such as the Regulatory Sandbox and the digital asset exchange framework, have further cultivated an environment conducive to responsible innovation. Against this backdrop, Klang Valley provides an ideal setting for investigating how Gen Z users engage with decentralized fintech platforms. However, persistent cybersecurity risks, fragmented regulatory frameworks, and speculative behavior continue to present serious obstacles to sustainable adoption.

This study leverages trust theory and the TAM model to help tackle these challenges; this study investigates the combined influences of digital literacy, social influence, perceived security, and risk tolerance on intention to use decentralized fintech platforms among Gen Z users while treating trust in technology as an essential mediating variable. Despite being a digitally native generation, Gen Z is incredibly tech-savvy and has an acute awareness of the cybersecurity challenges ahead of them (Javaheri et al., 2024). Such caution reflects that trust plays an intimate role in lowering perceived barriers and the adoption process (Shao et al., 2022). This study reveals the interplay among these dynamics. It contributes empirical data on this important issue, theoretical insights, and practical recommendations to fintech developers, policymakers, or instructors. The study promotes building and fully

integrating secure, user-friendly platforms that offer tangible examples along with focused educational programs to improve acceptance levels and develop trust while lowering the barriers of entry so that can have more people utilize the new financial revolution going on around us, especially in emerging markets (Xu et al., 2024). Moreover, this study makes a methodological contribution by integrating PLS-SEM and Necessary Condition Analysis (NCA) to provide a more comprehensive understanding of adoption intention in decentralized fintech platforms. The study answers the following research questions.

RQ1: What are the factors affecting the decentralized fintech platforms adoption intention among GenZ in Malaysia?
RQ2: Does trust in technology mediates the relationship between risk tolerance and behavioral intention to adopt decentralized fintech platforms?
RQ3: Is there any difference between the influencing factors for business and engineering students towards decentralized fintech platforms adoption intention?

2. Literature review and hypotheses development

2.1. Foundation theories for the research framework

This research adopts a dual-framework perspective, combining Trust theory and the Technology acceptance model (TAM) to research the adoption of decentralized fintech platforms. Trust theory points back to the significance of trust in such environments, which alleviates uncertainties and perceived risks, as there are no traditional institutional safeguards. In parallel, TAM reveals the significant determinants of end-user acceptance: perceived security and social influence (social norms) (David, 1989).

However, the decentralized fintech platforms context necessitates modifications to the original TAM structure. While perceived usefulness and perceived ease of use are pivotal in traditional technology adoption models, they may not sufficiently capture the concerns of users in decentralized finance, where issues of security, risk, and platform reliability dominate user decision-making. Prior research highlights that in high-risk digital environments such as DeFi, adoption is driven more strongly by users' perceptions of technological security, trust, and social influence rather than system usability alone (Gan & Lau, 2024; Ahmed et al., 2024; Shao et al., 2022). Therefore, this study adapts TAM by emphasizing constructs such as perceived security, trust in technology, risk tolerance and social norms to better reflect the specific behavioral drivers of decentralized fintech platforms adoption.

Trust in decentralized fintech ecosystems no longer relies on traditional intermediaries like banks or insurance corporations. Instead, it is secured by the platforms' technological means. Trust is, therefore, linked to the transparency, security, and immutability of blockchain protocols and smart contracts, which can inspire user confidence (Gan & Lau, 2024). In this study, trust was found to be one of the mediating factors that reduce risk perception and increase user confidence and intention to use decentralized platforms. Features like third-party audits, a secure blockchain infrastructure, and transparent operational practices can increase trust in users with platform (Shao et al., 2022).

This research provides a fully integrated perspective on the diffusion of decentralized fintech applications. Closely related to TAM is Trust theory, which focuses on the psychological components essential to instilling trustless systems. On the other hand, this dual framework approach focuses on addressing both cognitive and emotional motivators of use, which is consistent with recent thinking that suggests emphasis should be placed on technology to work effectively in tandem with human trust and adoption (Ahmed et al., 2024). By combining these two elements, this study proposes a framework that adds some theoretical depth and helps achieve practical implementation, for instance, to build a secure, accessible, and trustworthy decentralized fintech platform for broader financial inclusion across markets.

2.2. Intention to use decentralized fintech platforms

The intention to use decentralized fintech platforms in the financial technology space is vital, and there is a core motive to utilize decentralized fintech platforms. Drawing from the Technology Acceptance Model (TAM), behavioral intention is a key determinant of usage behavior. It can be defined as an individual's readiness to engage with specific technology (Bommer et al., 2023; Davis, 1989). This concept applies to decentralized fintech platforms by capturing how willing users are to use systems that operate without an intermediary and give them more freedom and control over their monetary transactions. This decentralization, however, also introduces technical complexities and heightened perceptions of risk in a cyber risk environment, making behavioral intention a multifaceted and context-sensitive variable (Gan & Lau, 2024).

Existing literature shows that individual, social, and technological factors can influence behavioral intention in decentralized fintech ecosystems. Digital literacy supports users in understanding how to interact with blockchain ecosystems while social influence (social norms), defined in TAM as the level to which individuals believe that important others believe they should use the technology, reinforce confidence through peer recommendations and community endorsements (Shao et al., 2022). In addition, trust in technology emerges as a crucial determinant, which can mitigate risks and encourage potential in decentralized platforms. This trust is reinforced and enriched by sharing transparency, verifiable security features, and third-party audits, which consequentially turn into better behavioral intention (Ahmed et al., 2024).

Generational dynamics adds a layer of complexity. As a digital native demographic, Gen Z is highly tech savvy but also acutely aware of the cyber risk environment. Decentralized fintech providers need tailored strategies to address this duality. Through intuitive user interfaces, educational efforts, and, in the future, robust security protocols, we can make core issues such as data privacy and platform reliability non-issues for Gen Z parsing these markets naturally (Trianto et al., 2023).

2.3. Digital literacy (DL)

In the fast-growing area of financial technology, digital literacy has emerged as an important determinant of decentralized fintech platform adoption behavior. Some formers are not limited to just the pragmatic ability to use digital tools but also extend those abilities into more sophisticated competencies necessary for understanding and interacting with complex technologies, including blockchain and smart contracts (Adamek & Solarz, 2023; Nilashi et al., 2024). Users who understand digital literacy adequately can also appreciate decentralized fintech features, identify risks, and make informed financial choices (Yathiraju & Dash, 2023). Decentralized fintech platforms are asking many of our brains. They are not concepts in traditional financial services where the role of intermediaries is to settle transactions and mitigate risks; rather, they require users to interact with decentralized protocols directly (Gupta et al., 2023). Such direct interaction requires greater technical sophistication, ranging from establishing digital wallets to conducting transactions through smart contracts (Sham et al., 2023). Without intermediaries, the onus is much more on users to protect their assets and manage the complexities of the technology.

Studies reveal that digital literacy affects not only initial usage but continued use. More specifically, Armani Dehghani et al. (2023) submitted that high digital literacy skills indicate resilience to these barriers through technological challenges and the persistence of cryptocurrency users and decentralized fintech services users over time. This implies that literacy in the digital world produces a positive feedback loop between increased competence and confidence in using decentralized fintech platforms (Shuhaiber et al., 2023). On the other hand, it could also make digital adoption very difficult. Users who do not understand decentralized fintech technologies may react by finding these

technologies too complex or risky, leading to avoidance behaviors (Adamek & Solarz, 2023). The lack of necessary skills can create a digital divide regarding financial access, with exclusion from the benefits of financial innovation reinforcing existing inequalities (Yeong et al., 2022). Hence, improving digital literacy is a case of individual empowerment and crucial for the greater adoption of decentralized fintech. Educational programs, as well as the design of platforms and community networks that can nurture higher levels of competence among users (Mohd Nor et al., 2021). This can increase access to decentralized fintech services and facilitate financial inclusion by reducing cognitive barriers.

Hypothesis 1. (H1): Digital literacy positively influences intention to use decentralized fintech platforms.

2.4. Social influence (SI)

Social influence is understood as a measure of how individual behavior can be influenced by people's expectations and behaviors (Bommer et al., 2023). Within decentralized fintech, social influence is expressed as recommendations from peers, discussions on social media platforms, and support from high-powered technology and finance thought leaders (Alshater et al., 2022)

In summary, positive social influence can increase user intention to use decentralized fintech platforms. Peer and social network orientations toward Decentralized fintech affect risk acceptance, which means that individuals will receive lower risks and higher benefits during adoption when peers or social networks have a positive attitude towards decentralized fintech (Ramly & Md Zabri, 2024). Such an effect is especially observed in collectivistic cultures or communities where the group's opinion has a significant weight on the effect of individuals (Colombo & Yarovaya, 2024).

Impacts of society and media beyond a personal network. Case studies from early adopters, high-profile endorsements, and mass media reports can help legitimize decentralized fintech technologies and create excitement (Yeong et al., 2022). Social proof, which is the psychological phenomenon where people assume the actions of others in an attempt to reflect correct behavior for a given situation, has been crucial in popularizing innovative technologies such as decentralized fintech (Sham et al., 2023). However, negative social perceptions can block the race of adoption. Concern regarding projector, scam caution, and witnesses from the social circle surrounding the sufferer can increase the voices of opposition against decentralized fintech platforms (Shuhaiber et al., 2023). Worsening the matter is misinformation and overblown reporting from media outlets regarding any security breach or regulatory crackdown.

Hypothesis 2. (H2): Social influence positively influences intention to use decentralized fintech platforms.

2.5. Perceived security (PS)

In cases like this, perceived security is one of the most important drivers of technology adoption because, in general, two opposing motivations govern a person's initial behavior toward any new technology, which are trust and risk, especially when it comes to financial (Al-Adaileh et al., 2024). In traditional finance, financial institutions usually protect customer assets; this is not the case in many scenarios in decentralized fintech platforms where users have complete control over their assets, making security an important concern (Ahmed et al., 2024). High-profile hacking or fraud incidents in the decentralized fintech space can write off a lot of trust from users (Raddatz et al., 2021). On the other hand, solutions that prioritize security through community-based audits, more transparency on their security practices, and advanced security functionality can create better-perceived security.

It is also crucial to avoid any security-related concerns as they can hinder trust and even further technology adoption. Users want to ensure that the platform is safe, has their assets and data protected from unauthorized access, and will not succumb to technical failures (Shao et al., 2022). Providing users with information on security policies and practices (such as keeping private keys safe or identifying phishing can also make them feel safer (Song et al., 2022). In addition to this assurance, implementing decentralized insurance mechanisms or smart contract fail-safes can further limit risk and increase user confidence (Shuhaiber et al., 2023). Addressing security challenges in advance can also lower the resistance to the adoption of decentralized fintech platforms and create long-term trust with users.

The potential of younger users using decentralized fintech platforms relies heavily on their critical concern about cybersecurity. Frequent headlines related to cybercrime and fraud in the ecosystem may deter Gen Z, who is highly aware of digital security, from using decentralized fintech platforms (Wronka, 2021; Vučinić & Luburić, 2022). Studies demonstrate that younger users perceive security as safety, and thus, their trust relies on decentralized fintech platforms when there is no central authority. This absence of equivalent oversight may increase their fears (Suri et al., 2024). To rise the intention to use among this user group, DeFi platforms can increase trust by adding visible security features such as blockchain for risk mitigation and decentralized insurance mechanisms)

Hypothesis 3. (H3): Perceived security positively influences the intention to use decentralized fintech platforms.

2.6. Risk tolerance (RT)

Risk tolerance is an indication of the would-be investor's ability to put his/her funds at risk by weighing the available options against potential losses (Alsmadi et al., 2023). Risk, in terms of volatility and regulation, matters a lot regarding user participation in decentralized fintech (Abou Ali, 2024). While perceived risk captures an individual's assessment of external threats and uncertainties, risk tolerance reflects the internal willingness to accept and endure such risks, particularly in high-volatility environments like decentralized finance (Weber et al., 2002; Saengchote et al., 2023). Decentralized fintech is often considered an innovation and a higher return opportunity, aligning with less risk-averse user indicators (Bodo & de Filippi, 2024; Saengchote et al., 2023). According to Gan and Lau (2024), they might also feel better equipped to navigate the ambiguities and complexities of decentralized systems. This willingness to take risks translates into a higher intention to use and experiment with decentralized fintech services.

It also plays a role in how trust is built when it comes to technology. People comfortable with risk may be more likely to trust decentralized systems and blockchain technology themselves (Shao et al., 2022). This trust strengthens their intention of using decentralized fintech platforms because they believe in a technology that can deliver the solutions it promises. On the contrary, those with a lower risk appetite may need extra justification before adopting decentralized fintech (Raddatz et al., 2021). However, for these users, perceived risks may exceed expected benefits. Hence, applicants should work on establishing trust and reducing ambiguities (Shuhaiber et al., 2023).

Hypothesis 4. (H4): Risk tolerance positively influences intention to use decentralized fintech platforms.

Hypothesis 5. (H5): Risk tolerance positively influences trust in technology.

2.7. Trust in technology (T)

According to Ahmed et al. (2024), trust in technology is among the most critical factors determining the extent of adoption of decentralized fintech platforms. It summarizes users' belief in the technology's dependability, safety, and effectiveness. Where there are no regulatory frameworks, it is trust in the trustless technology infrastructure itself

(Shao et al., 2022). Trust functions as a mediating variable between risk perception and behavioral intention. This lowers the uncertainty and perceived risks, allowing the users to interact with decentralized fintech services more securely (Bommer et al., 2023). Establishing trust involves showing ICT integrity, clarity, and responding to user concerns and needs (Shuhaiber et al., 2023). More efforts could also be made to increase trust, such as transparency about security procedures, third-party audits, and user education campaigns (Ahmed et al., 2024). Decentralized fintech platforms can strengthen users' trust and encourage adoption by proactively tackling potential roadblocks while creating an environment of openness.

Hypothesis 6. (H6): Trust in technology positively influences intention to use decentralized fintech platforms.

Hypothesis 7. (H7): Trust in technology mediates the relationship between risk tolerance and intention to use decentralized fintech platforms.

Integrating the TAM model with trust theory is a total consideration for monitoring decentralized fintech adoption (Davis, 1989). In contrast, the model treats digital literacy and social influence as direct antecedents to behavioral intention and perceived security. The TAM model and trust theory provide a holistic framework for studying decentralized fintech adoption. The attitude of accepting risk influences both indirect and direct behavioral intention through trust in technology. This dual pathway also reflects the complexity in the internal processing of users when it comes to new technology, that is, their psychological processes result from some ambiguity (Alsmadi et al., 2023). To address these inherent barriers to technology adoption, trust in technology acts as an important mediator as it reduces perceived risk and ease of adoption. This complex framework is consistent with recent literature focusing on individual social and technological factors contributing to technology adoption (Bommer et al., 2023). It serves as a solid basis for testing and practical application in the context of decentralized fintech platforms. Fig. 1 shows the research framework.

3. Methodology

The research is quantitative in nature. The measurement construct of these variables is adapted from prior studies. The measurement items for DL were adapted from Nikuo et al. (2022), SI and BI were adapted from Yan et al. (2021), PS from Roh et al. (2024), trust in technology from Dianty and Faturohman (2023), and RT from Bansal and Bagadia (2018). The measurement items are available in the Appendix. Apurposive sampling strategy was employed to target a specific subgroup relevant to the research objectives—GenZ students who are currently enrolled in business, engineering or other programs at universities located in Klang Valley, Malaysia. Participants were selected based on the following inclusion criteria: (1) aged between 18 and 28, (2) currently enrolled in a university in Klang Valley, (3) pursuing a degree in business, engineering, or others and (4) possessing basic familiarity with financial technology applications. The minimum sample size is determined based on the guidelines by Sekaran and Bougie (2016), which suggest at least of at least 384 respondents for non-probability sampling when the population is more than one million.

The population and sample of study are the GenZ. According to Mckinsey & Company (2024), GenZ is defined as individuals born between 1996 and 2010. Their identity has been profoundly shaped by the digital era, global economic shifts, climate-related concerns, and the COVID-19 pandemic. The data were collected using Google forms from the students who are part of GenZ and studying at different universities in Klang Valley, Malaysia. Klang Valley, Malaysia, was chosen for this study due to its status as the country's leading financial and technological hub, home to numerous universities with a diverse student population. As a rapidly digitizing region, it provides an ideal setting to examine Gen Z's adoption intention of decentralized fintech platforms. The high internet penetration and fintech awareness among students make it a suitable location for studying perceptions of cybersecurity and financial technology. The study used a five-point Likert scale to measure the constructs, and customized items were employed to ensure the study's accuracy and consistency with previous technology adoption research (Lazar et al., 2020). Each item in the survey asks respondents to indicate how much they agree or disagree on a scale of 1 for "strongly disagree" to 5 for "strongly agree." Data were collected using a survey questionnaire administered via Google forms. The survey was distributed through university mailing lists, student WhatsApp and Telegram groups, and with support from faculty coordinators in business, engineering, and other programs at universities located at Klang Valley. Of the 500 students approached, 397 responded (79.4 % response rate),

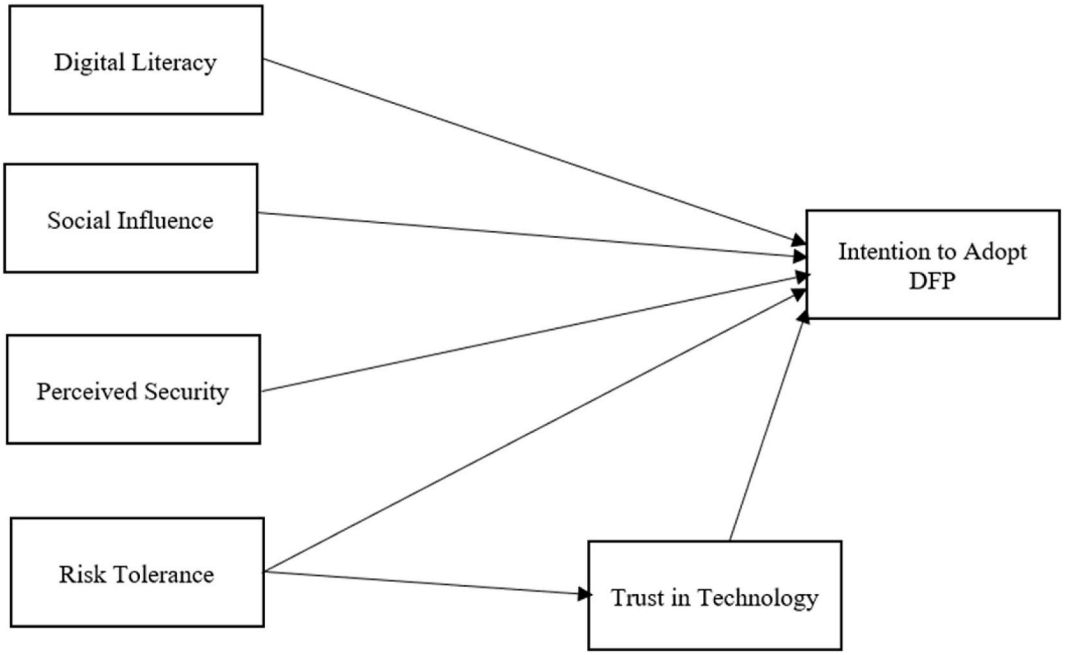

Fig. 1. Research framework.

with 391 valid responses retained after excluding incomplete and outlier entries. Written informed consent was obtained from the respondents through the Google form. Ethical approval was taken from the University of Debrecen. The first phase of data was collected in January 2024. The second phase of data was collected after three months in April 2024. The time lags between the predictor and criterion variables measurements were used, reducing respondents' ability to relate the two directly and reducing common method bias (Podsakoff et al., 2003).

The study utilized the PLS-SEM to analyze the data using SmartPLS 4.1.0.3. The study also utilized Necessary Condition Analysis (NCA) to determine the essential conditions for intention to adopt decentralized fintech platforms. Finally, the results were validated by the experts in the field by employing mixed method approach.

4. Findings

The respondents' demographic details were collected from the Google form they filled out online. Table I shows the details of the survey respondents.

Table 1 indicates the respondent's profile of the study. It shows that males constitute the majority, with 229 participants (58.6 %), while females account for 162 (41.4 %). In addition, most respondents are enrolled in business programs (189 individuals, 48.4 %), with engineering program respondents making up 42.2 %. A small portion is categorized under other programs, consisting of 9.4 %. Moreover, the undergraduate students are most of the respondents, consisting of 69.6 %, followed by 30.4 % of postgraduate students.

4.1. Measurement model assessment

The study followed specific criteria in order to examine quality criteria, such as construct validity, construct reliability, and outside loadings, to evaluate the measurement model. Moreover, common method bias was checked before moving to the subsequent phases.

The study used two different approaches to evaluate any common method bias that might occur throughout the Partial Least Squares Structural Equation Modeling (PLS-SEM) verification process. The study also followed Kock's (2015) recommendations for PLS-SEM verification steps to determine whether the latent variables showed multicollinearity. All variation inflation factor (VIF) values, which ranged from 1.025 to 2.989 and remained below the crucial value of 3.3, were within acceptable bounds. There was little association between the new marker variable (M1) and the existing latent variables. No statistically significant, according to M1, representing facilitating conditions (Podsakoff et al., 2024). According to the findings, common method bias should not be a problem.

The measurement model suggests a benchmark value of 0.708 or greater after looking at indicator outer loadings (Hair et al., 2017). Cronbach's alpha and composite reliability are used to assess internal consistency reliability; values greater than 0.70 indicate significant internal consistency. At a minimum threshold of 0.50 or above, AVE—a measure of the variance's explanatory capacity for the concept—is tested for convergent validity. The data for Cronbach's alpha, AVE, composite reliability, and outer loadings of the items are displayed in Table 2. Table 2 confirmed that the minimal requirements were fulfilled.

The robustness of the model is confirmed by evaluating the measurement model's discriminant validity using the Heterotrait-Monotrait (HTMT) ratio of correlations. The heterotrait-monotrait (HTMT) ratio of correlations was developed by Henseler et al. (2015) as a substitute technique for evaluating discriminant validity. A high HTMT rating indicates discriminant validity issues. For structural models with conceptually related constructs, the cutoff value is set at 0.90. For conceptually distinct constructs, the requirement is lower, at 0.85. Table 3 displays the HTMT scores. All the results satisfied the minimal requirements. Evidence of convergent and discriminant validity suggests that the measurement model is appropriate and trustworthy for the PLS-SEM study's findings.

4.2. Structural model assessment

The bootstrapping technique was utilized in this study to evaluate the significance of the path coefficient. Table 4 displays the path coefficient values essential for assessing the study's hypotheses and findings. If a hypothesis's p-value is less than 0.05, it is regarded as valid. The findings in Table 4 confirm the hypotheses H1, H2, H3, H4, H5, and H6 because their p-values are less than 0.05. A post-hoc analysis was conducted, and the results are shown in Table V. According to Table 5, T showed a mediating effect between RT and BI. Fig. 2 shows the results from the Bootstrapping Procedure.

To validate the findings, face-to-face interviews were conducted with three experts who have more than 10 years of research experience in technology adoption, behavioral finance, and fintech studies. In total, five questions were asked to the experts. First question was related to effects of digital literacy on DFP adoption intention. They were asked to share their opinion and perception about the key factors that contribute to the significant effect of digital literacy on Gen Z's intention to adopt DFP platforms and what specific elements of digital literacy play crucial role in DFP adoption intention. Expert A replied "*In my expert opinion, the key factors are Gen Z's strong proficiency in navigating digital interfaces and their confidence in evaluating online financial information. Specifically, elements like cybersecurity awareness, critical thinking, and platform usability skills play a crucial role in driving their adoption of decentralized fintech platforms.*" In addition, Expert B said that "*Gen Z has been exposed to*

Table 1
Respondents profile.

Demographic Variable	Frequency	Percentage
Gender		
Male	229	58.6
Female	162	41.4
Program Enrolled		
Engineering (Architecture, EEE, CSE, Civil, etc)	164	42.2
Business (Accounting, Finance, Marketing, etc.)	189	48.4
Others (English, Law, etc.)	38	9.4
Type of Student		
Undergraduate	272	69.6
Postgraduate	119	30.4

Table 2
Outer loadings, reliability, and convergent validity scores.

Variable	Items	Outer Loadings	Cronbach's Alpha	Composite Reliability	AVE
Digital Literacy (DL)	DL1	0.778	0.860	0.876	0.635
	DL2	0.840			
	DL3	0.715			
	DL4	0.870			
	DL5	0.772			
Social Influence (SI)	SI1	0.835	0.803	0.809	0.630
	SI2	0.837			
	SI3	0.769			
	SI4	0.728			
Perceived Security (PS)	PS1	0.841	0.848	0.849	0.688
	PS2	0.812			
	PS3	0.849			
	PS4	0.815			
Intention to use (BI)	BI1	0.847	0.759	0.763	0.675
	BI2	0.833			
	BI3	0.782			
Risk Tolerance (RT)	RT1	0.873	0.844	0.852	0.762
	RT2	0.865			
	RT3	0.880			
Trust in Technology (T)	T1	0.840	0.845	0.857	0.683
	T2	0.861			
	T3	0.755			
	T4	0.845			

Table 3
HTMT scores.

	BI	DL	PS	RT	SI	T
BI						
DL	0.165					
PS	0.825	0.099				
RT	0.647	0.063	0.632			
SI	0.756	0.111	0.740	0.551		
T	0.779	0.089	0.895	0.516	0.668	

The coefficient of determination is a statistical tool used to estimate the extent to which variations in one variable are attributable to changes in another. R^2 value of BI is 0.552, which means DL, SI, PS, RT, and T account for 55.2 % of the variation in BI. SI showed the highest effect size among the independent variables.

Table 4
Direct path coefficient results.

Hypotheses	Path	β	P values	Decision
H1: Digital literacy positively influences intention to use decentralized fintech platforms	DL -> BI	0.093	0.018	Supported
H2: Social influence positively influences intention to use decentralized fintech platforms.	SI -> BI	0.226	0.000	Supported
H3: Perceived security positively influences intention to use decentralized fintech platforms.	PS -> BI	0.241	0.000	Supported
H4: Risk tolerance positively influences the intention to use decentralized fintech platforms.	RT -> BI	0.194	0.000	Supported
H5: Risk tolerance positively influences trust in technology	RT -> T	0.449	0.000	Supported
H6: Trust in technology positively influences the intention to use decentralized fintech platforms.	T -> BI	0.226	0.000	Supported

Table 5
Post hoc analysis.

Hypotheses	Path	β	P values	Decision
H7: Trust in technology mediates the relationship between risk tolerance and intention to use decentralized fintech platforms	RT -> T -> BI	0.101	0.002	Supported

technological products since they were young. Undoubtedly, they have higher digital literacy than any generation before them. They are also well-equipped with skills such as protecting personal information and evaluating online financial services. Hence, being able to quickly learn and adapt to new digital tools also plays a crucial role in their decision to adopt these platforms." Finally expert C quoted "*I think digital literacy includes more than simply technical proficiency; it also includes risk management, cybersecurity awareness, critical thinking, and an openness to innovation. These traits, in turn, greatly influence Gen Z's confidence and desire to use decentralized finance systems*".

Next, experts were asked about their perspectives on the key factors that drive the impact of social influence on Gen Z's intention to adopt these platforms and whether peer pressure, social networks, or societal trends shape their decision to engage with decentralized fintech solutions. Expert A answered "*In my perspective, peer recommendations, social media endorsements, and the desire to align with emerging digital finance trends strongly drive Gen Z's adoption intentions. Social networks amplify trust and perceived credibility, making decentralized fintech solutions more appealing to them.*" In addition, expert B claimed "*Gen Z often looks to their friends and social networks when deciding what new technology to trust and use. Peer pressure and seeing others succeed with decentralized fintech platforms make them more willing to try it themselves. Popular trends on social media also create a sense of urgency and excitement that pushes them to adopt these decentralized fintech solutions*". Finally, expert C believed "*Gen Z's decision-making processes are greatly influenced by peer networks, social media exposure, and dominant societal narratives about innovation and empowerment. Through mechanisms of trust, belonging, and trend-following behavior, these factors hasten the adoption of decentralized financial platforms*".

Next question was about the opinion on influence of perceived security on Gen Z's intention to adopt DFP and whether concerns about data privacy, transaction safety, or platform trustworthiness affect Genz willingness to engage with decentralized fintech platforms. Expert A conveyed "*Gen Z's sensitivity to data privacy, fear of financial fraud, and demand for transparent security protocols significantly contribute to the influence of perceived security. High confidence in platform trustworthiness and robust transaction safety directly enhances their willingness to adopt decentralized fintech solutions*". Moreover, expert B stated "*Gen Z cares a lot about the safety of their personal information and money when using digital platforms. If they feel that a decentralized fintech platform is secure and trustworthy, they are more likely to use it. Concerns about data privacy and transaction safety can easily stop them from trying new platforms if they sense any risk*." According to expert C, "*Gen Z's ambition to embrace decentralized finance is mostly dependent on the platform's capacity to exhibit robust, reliable security features. Their faith in these new financial solutions is largely shaped by their concerns about data privacy, transaction security, and platform transparency*."

The fourth question was about the factors that contribute to the impact of risk tolerance on Gen Z's intention to adopt DFP. According to expert A "*Gen Z's openness to financial experimentation and their strong affinity for technological innovation contribute significantly to the impact of risk tolerance. Their willingness to embrace calculated risks, driven by a desire for autonomy and early adoption of emerging trends, shapes their engagement with decentralized fintech platforms*". Expert B replied "*Gen Z is generally more open to taking financial risks, especially when they believe there is a chance for higher rewards. Their positive view of innovation makes them willing to try new financial technologies like decentralized fintech platforms. This mix of risk-taking and excitement about new ideas strongly pushes them to adopt these decentralized fintech solutions*". Moreover, expert C stated "*I think Gen Z's inclination to use decentralized fintech platforms is greatly influenced by their greater risk tolerance, as well as their favorable views towards innovation, alternative finance, and opportunity-seeking behavior. They view risk as a necessary means of achieving financial progress, empowerment, and innovation rather than as something that should be avoided*".

The last question was about their perception on the influence of trust in technology on GenZs intention to adopt DFP. Expert A conveyed "*In my view, Gen Z's positive past experiences with reliable digital technologies and their confidence in innovations like blockchain significantly strengthen their trust in technology. This trust, reinforced by platform reliability and transparent operations, greatly enhances their willingness to adopt decentralized fintech solutions*." According to expert B "*Gen Z grew up using technology, so positive past experiences make them more confident in trying new digital platforms. When they see that a platform is reliable and based on trusted technology like blockchain, it builds their trust even more. This trust makes them feel safe and ready to engage with decentralized fintech solutions*". Moreover, expert C stated "*I think lifelong pleasant digital experiences, faith in the security and effectiveness of decentralized systems like blockchain, and a cultural optimism towards technical advancement are the cornerstones of Gen Z's trust in technology. All of these elements work together to make them eager and confident to interact with decentralized finance platforms*".

Based on the perspective of the experts, it is evident that digital literacy, social influence, risk tolerance, perceived security, and trust in technology are considered as crucial factors that influence Gen Z of Malaysia to adopt decentralized fintech platforms. So, it can be

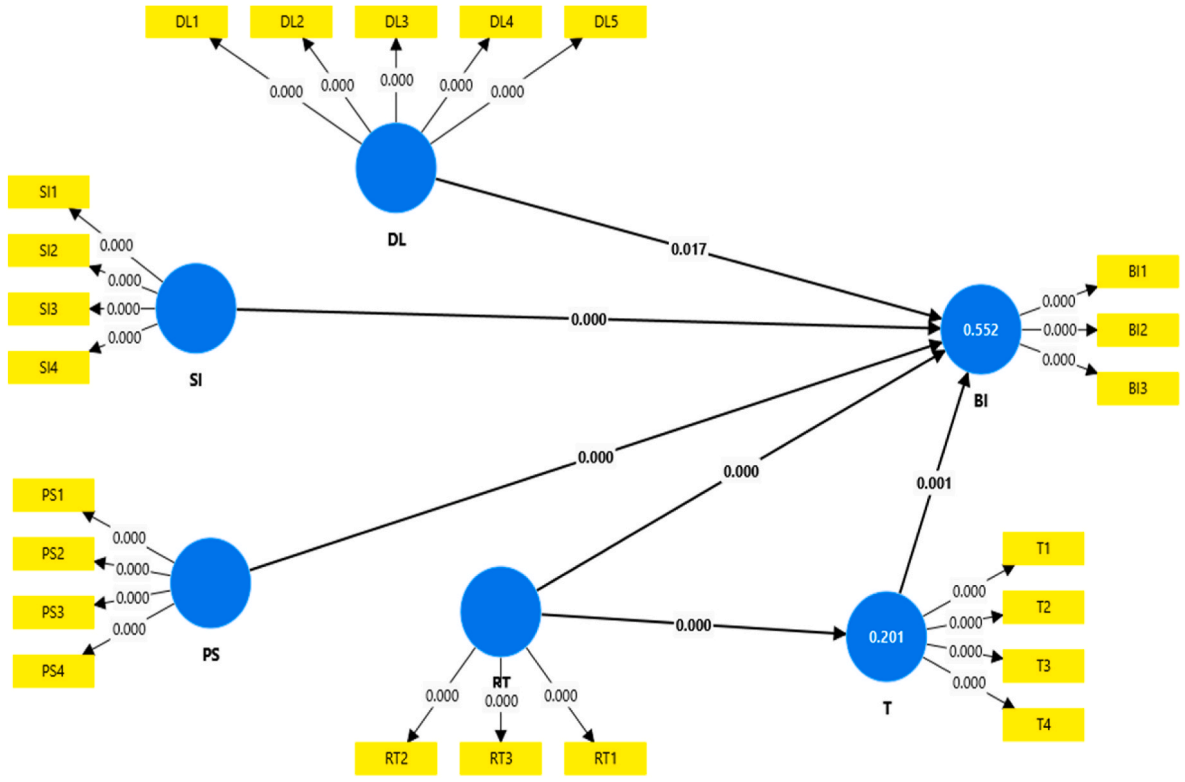

Fig. 2. Results from the bootstrapping procedure in SmartPLS 4.1.0.3.

concluded that, experts opinions and perceptions are aligned with the results of the study.

Following the recommendation of Shmueli et al. (2019), a PLS-Predict analysis was also conducted to evaluate the model's predictive power. As presented in Table VI, the errors from the PLS-SEM model were consistently lower than those produced by the benchmark LM model, concluding that the study model demonstrates moderate predictive capability.

4.3. Necessity condition analysis (NCA)

Traditionally, marketing research relies on sufficiency logic to examine the factors influencing consumer adoption behavior. This perspective assumes that each factor contributes to adoption intention, but no single factor is indispensable. In contrast, necessity logic argues that an outcome is only achievable if a specific factor exists. Therefore, the study utilized Necessary Condition Analysis (NCA) to determine the essential conditions for intention to adopt decentralized fintech platforms (Dul, 2016)

According to Dul (2019), a condition is considered necessary if it meets three criteria: (i) theoretical justification, (ii) an effect size ($d > 0$), and (iii) a statistically significant p-value ($p < 0.05$). The theoretical justification for necessity logic in the adoption intention of deFi is based on the TAM model and trust theory, which proposes that perceived security, trust in technology, risk tolerance, social influence, and digital literacy are critical prerequisites for adopting decentralized fintech adoption. Potential outliers must be identified before assessing the effect size, as extreme values can influence the necessity of effect size in NCA. A visual inspection of scatter plots (Figs. 3–7) revealed no significant outliers, affirming the robustness of the analysis.

The NCA results (Table 7) reveal that Perceived Security (PS) ($d = 0.274$, $p < 0.05$), Risk Tolerance (RT) ($d = 0.158$, $p < 0.05$), Social Influence (SI) ($d = 0.270$, $p < 0.05$), and Trust in Technology (T) ($d = 0.145$, $p < 0.05$) are necessary conditions for the intention to adopt decentralized fintech platforms. However, Digital Literacy (DL) ($d = 0.000$, $p < 0.05$) does not qualify as a necessary condition. Although Digital Literacy has a statistically significant positive influence on behavioral intention in the structural model, it does not appear as a necessary condition in the NCA because of digital nativity of Gen Z. As digital natives, most Gen Z individuals already possess a baseline level of digital competence that enables them to navigate fintech platforms with ease (Thangavel & Chandra, 2024). Therefore, while higher digital literacy may enhance intention, it is not a strict prerequisite. Even those with moderate or low levels of digital literacy can still form an intention to adopt decentralized fintech services due to intuitive design, peer influence, or trust in the platforms (Bermeo-Giraldo et al., 2023).

Additionally, bottleneck analysis (Table 8) was conducted to determine the threshold levels of necessary conditions for achieving different levels of adoption intention. The results indicate that to reach a 50 % level of adoption intention; four conditions must be satisfied: perceived security at no less than 2.512, risk tolerance at no less than 2.324, social influence at no less than 2.146, and trust in technology at no less than 1.582. These findings highlight the importance of ensuring security, trust, and risk tolerance while leveraging social influence to drive fintech adoption.

Table 6
PLS-predict result.

	Q^2predict	PLS-SEM_RMSE	LM_RMSE	PLS-LM RMSE
BI1	0.388	0.467	0.472	−0.005
BI2	0.294	0.462	0.469	−0.007
BI3	0.305	0.472	0.483	−0.011

4.4. Multigroup analysis

The multigroup analysis enables the examination of whether predefined data groups exhibit significant differences in their specific parameter estimates (i.e. path co-efficients, p-value etc.) (Ringle et al., 2024). This study employed the multigroup analysis test to find out

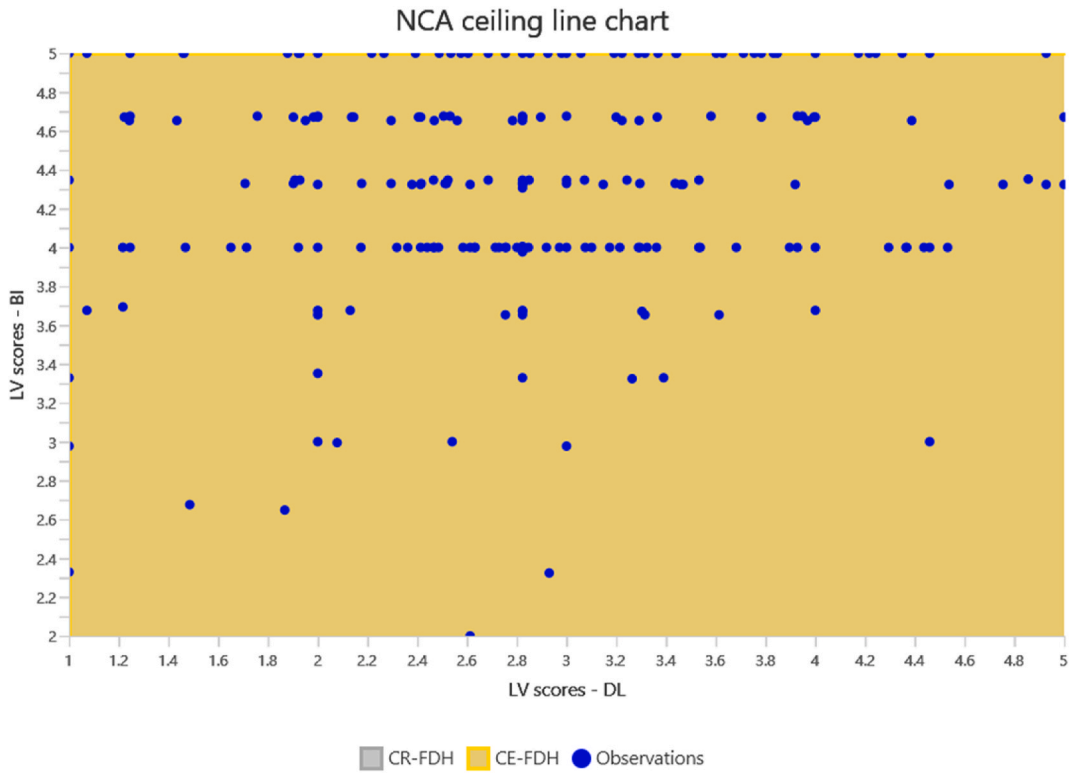

Fig. 3. Digital literacy scatter plot.

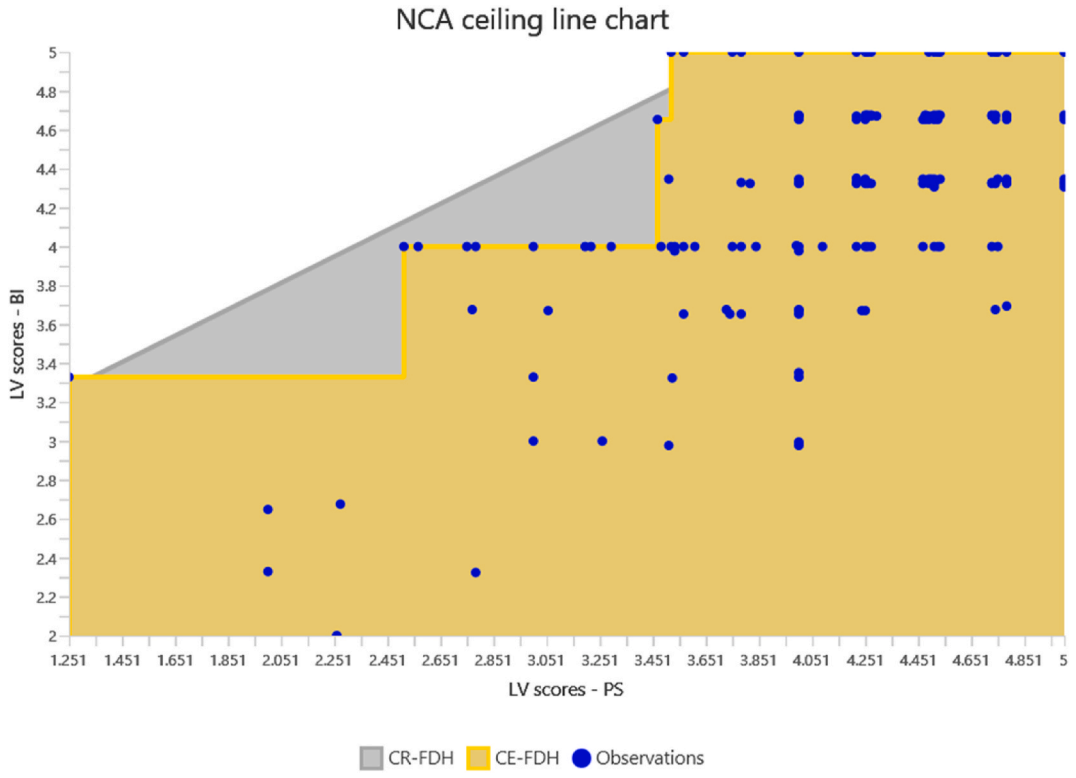

Fig. 4. Perceived security scatter plot.

whether any significant differences exist between engineering and business students in terms of decentralized fintech platforms adoption intention. Table 9 shows the results bootstrapping results of multigroup analysis.

Table 9 indicates the multigroup analysis bootstrapping results between the engineering and business students in terms of their adoption intention towards decentralized fintech platforms. The findings reveal notable differences. For business students, digital literacy ($\beta = 0.075$, p

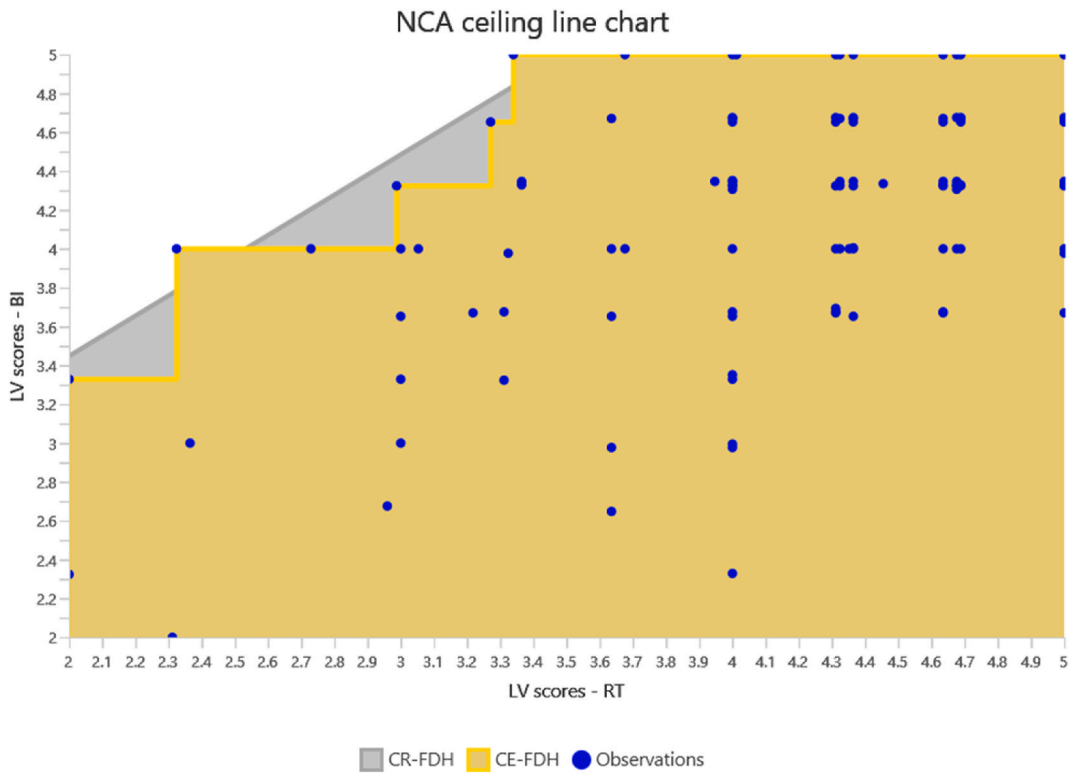

Fig. 5. Risk tolerance scatter plot.

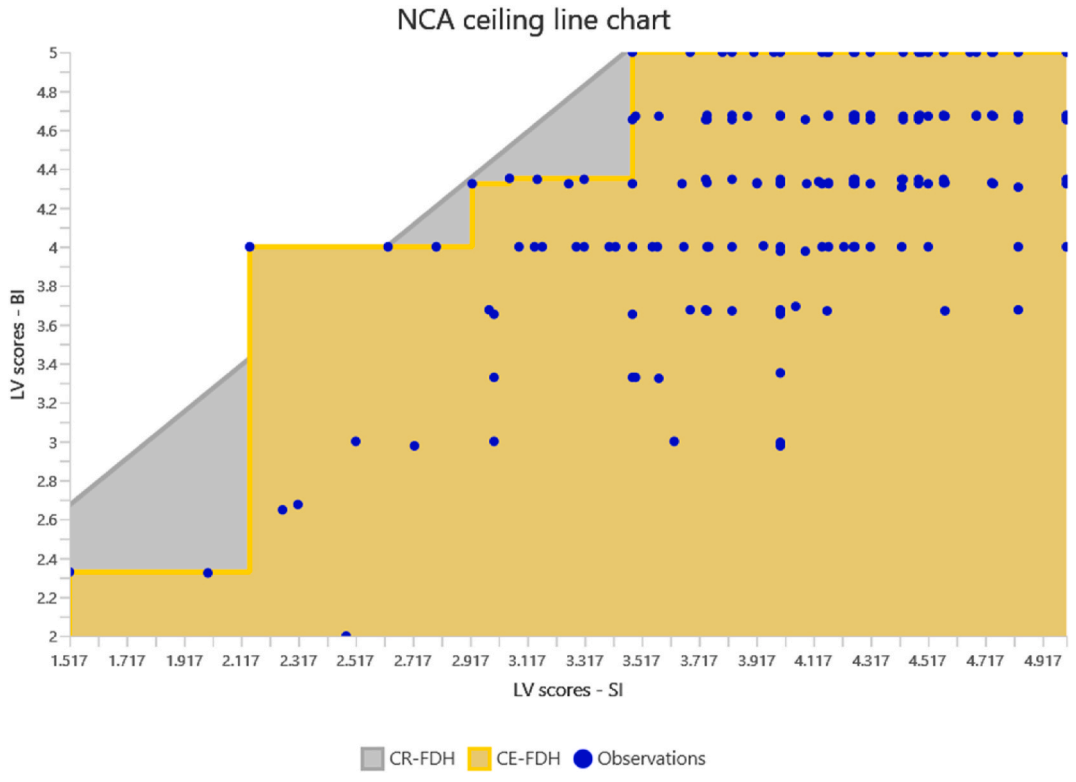

Fig. 6. Social influence scatter plot.

= 0.011) significantly influences behavioral intention, while results for engineering students show non-significant (p = 0.606) relationships. This suggests that business students' adoption intention is more sensitive to their digital skills. In addition, their curriculum and future careers heavily emphasize financial technologies and digital business tools. Whereas, engineering students may already possess a baseline digital proficiency, reducing their discriminative power.

Perceived security, and trust in technology showed significant effect

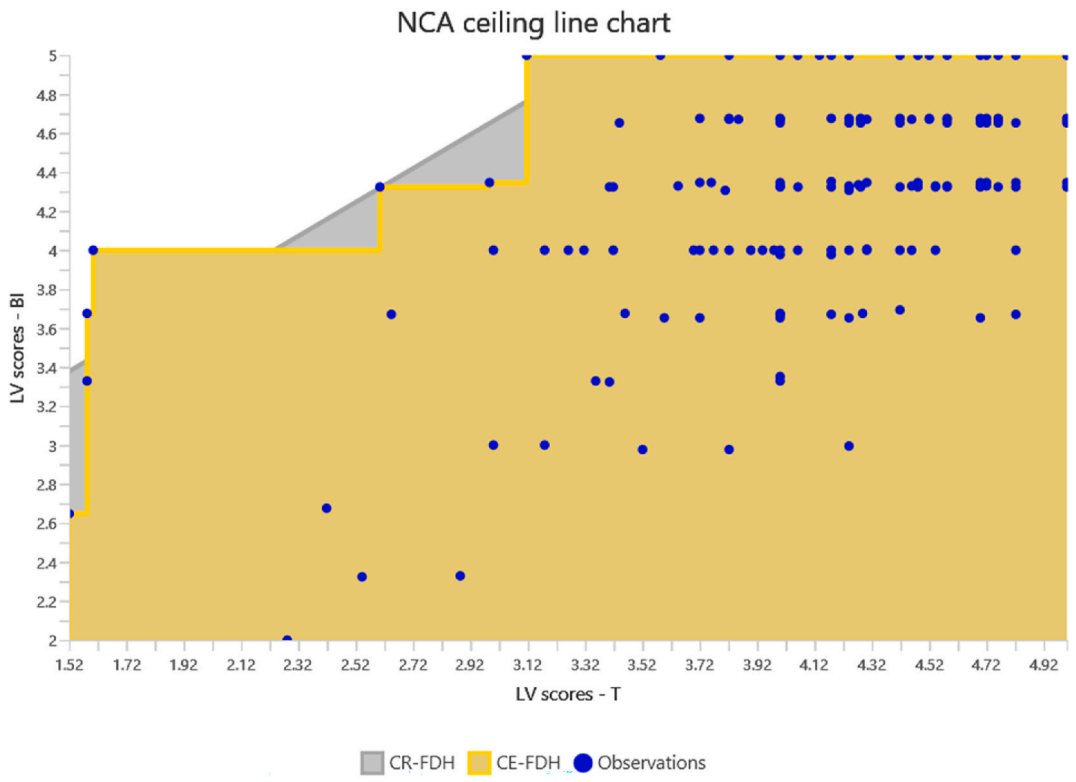

Fig. 7. Trust in technology scatter plot.

Table 7
NCA effect sizes.

	Original effect size	Observations above the Ceiling	p value
Digital Literacy	0	0	0.000
Perceived Security	0.274	0	0.000
Risk Tolerance	0.158	0	0.000
Social Influence	0.270	0	0.000
Trust in Technology	0.145	0	0.000

Table 8
Bottleneck table (percentage level).

BI	DL	PS	RT	SI	T
0.00 %	NN	NN	NN	NN	NN
10.00 %	NN	NN	NN	NN	NN
20.00 %	NN	NN	NN	2.146	NN
30.00 %	NN	NN	NN	2.146	1.582
40.00 %	NN	NN	NN	2.146	1.582
50.00 %	NN	2.512	2.324	2.146	1.582
60.00 %	NN	2.512	2.324	2.146	1.604
70.00 %	NN	3.468	2.988	2.924	2.604
80.00 %	NN	3.468	3.271	3.483	3.116
90.00 %	NN	3.519	3.34	3.483	3.116
100.00 %	NN	3.519	3.34	3.483	3.116

on behavioral intention for both groups. However, PS is stronger among engineering students ($\beta = 0.230$, $p = 0.046$) compared to business students ($\beta = 0.171$, $p = 0.041$). This suggests that engineering students access the critical aspects of decentralized fintech platforms more deeply because of their technical background. Both groups also showed a significant relationship between risk tolerance and trust in technology, and trust in technology and behavioral intention. This reinforces that trust in technology is a crucial bridge for adoption across both disciplines' students.

Risk tolerance is significant for business students ($\beta = 0.219$, $p = 0.000$) but not for engineering students ($p = 0.177$). This implies that business students' adoption intention is more influenced by their willingness to take risks. Risk tolerance is a trait that is often nurtured in business education that values innovation. On the other hand, engineering students might adopt a more systematic approach in terms of decentralized fintech platforms adoption intention.

Finally, social influence showed significant effect for business students ($\beta = 0.225$, $p = 0.000$) but not for engineering students ($p = 0.214$). The reason can be that the business students might be more socially driven in their adoption behavior because of higher exposure to peer influences regarding financial technology trends. Conversely, engineering students rely more on technical assessments rather than peer opinions.

4.5. Discussion

The study's first hypothesis suggested that DL positively affects BI. Table IV 0indicates that DL (p-value = 0.018) positively affects BI. This aligns with previous research (Armani Dehghani et al., 2023). Gen Z's higher digital literacy levels enable them to comprehend the mechanisms and benefits of decentralized platforms, including enhanced privacy and diminished reliance on traditional financial institutions. Although digital literacy was found to have a statistically significant influence on the intention to adopt decentralized fintech platforms, the effect size was relatively small ($\beta = 0.093$). This suggests that while digital competence may facilitate adoption, it is not a dominant predictor. This aligns with the NCA results, which also suggest that digital literacy is not a necessary condition. Together, these findings indicate that while digital literacy plays a supporting role, it is not a critical driver of adoption intention among Gen Z users. For practitioners and platform developers, this implies that simply providing educational materials or digital literacy initiatives may not be sufficient to drive adoption. Instead, efforts should also focus on improving user experience, interface simplicity, and guided onboarding, especially for those

Table 9
Results of multigroup bootstrapping.

	β (Group_Engineering)	β (Group_Business)	p value (Group_Engineering)	p value (Group_Business)
DL - > BI	0.039	0.075	0.606	0.011
PS - > BI	0.230	0.171	0.046	0.041
RT - > BI	0.121	0.219	0.177	0.000
RT - > T	0.604	0.523	0.000	0.000
SI - > BI	0.107	0.225	0.214	0.000
T - > BI	0.270	0.229	0.036	0.007

with moderate tech familiarity. Study's second hypothesis examined the influence of SI on BI. The findings reveal that SI (p-value = 0.000) has a significant positive effect on BI, corroborating earlier studies (Colombo & Yarovaya, 2024; Ramly & Md Zabri, 2023). GenZ's confidence in decentralized finance platforms is frequently influenced by the perspectives and experiences conveyed by their contemporaries, influencers, and digital communities. When trusted sources within their social circles endorse or adopt these platforms, it can help mitigate concerns about cybersecurity and instill a sense of confidence in Gen Z to try them out themselves. The favorable feelings and firsthand narratives from these prominent individuals significantly influenced Gen Z's perspectives and readiness to participate in decentralized financial technologies. For fintech marketers and platform designers, this highlights the importance of leveraging peer-driven campaigns, influencer partnerships, and community engagement strategies to build trust and accelerate adoption among this cohort. The emotional resonance of peer recommendations and firsthand success stories may often carry more weight than technical specifications or institutional endorsements in influencing Gen Z behavior.

The third hypothesis suggested the influence of PS on BI. The findings reveal that PS (p-value = 0.000) significantly positively affects BI, supporting earlier studies (Wronka, 2021; Vučinić & Luburić, 2022). In Malaysia, the intention to use decentralized fintech platforms amongst Gen Z is influenced by what they perceive as security. As such, they would adopt if they thought these platforms provide reasonable protection against the evils of cyberspace (pauper with cyber attackers); strong cyber security presence gives them faith that their data and valuable assets are safe, which creates high trust and willingness to engage. Fintech providers must therefore not only implement robust security measures but also communicate these protections clearly and credibly to users. This could include visible security badges, two-factor authentication prompts, or transparent explanations of blockchain integrity to foster a sense of control and safety.

The fourth and fifth hypotheses suggest that RT affects BI and T. The results from Table 4 indicate that RT affects both BI and T. These results are relevant to the earlier studies (Bodo & de Filippi, 2024; Saengchote et al., 2023). In Malaysia, cybersecurity risk tolerance alters Gen Z's intention of adopting decentralized fintech platforms as this perception gives the youth trust in the technology regarding this dark side. They display a high-risk tolerance that allows them to ignore possible security threats, recognizing the value of innovation and control from blockchain applications as an asset; thus, displaying low-risk tolerance leads to more significant concern regarding security through a lack of engagement with these platforms. Moreover, hypothesis (H6) demonstrates that T (p-value = 0.000) significantly affects BI. The result is similar to those of earlier studies (Nikou et al., 2022). When Gen Z believed these platforms were secure and reliable, their cybersecurity concerns diminished, making them more willing to engage. Strong trust mitigates perceived risks, fostering confidence in data protection and transaction safety and encouraging adoption. In practical application, this underscores the importance of trust-building strategies such as third-party audits, transparent governance, user testimonials, and community-based moderation to reassure users of the platform's integrity. Particularly for Gen Z, who value both digital empowerment and transparency, platforms that visibly demonstrate security, accountability, and user protection are more likely to gain traction.

According to Table 5, hypothesis (H7) demonstrates that T (p-value = 0.002) mediates the relationship between RT and BI. This result is found in earlier literature (Singh & Sinha, 2020). The findings of this study indicate a partial mediation effect of trust in technology on the relationship between risk tolerance and behavioral intention to adopt decentralized fintech platforms. While risk tolerance independently influences intention, the presence of trust in the underlying technology significantly enhances this effect. This partial mediation suggests that even individuals with a low-risk appetite may consider adoption when they perceive technology (e.g., blockchain) as trustworthy and secure. This also indicates that a high level of trust in the underlying technology, such as the blockchain's secure architecture, can alleviate their perceived cybersecurity risks, thus closing the gap between risk tolerance and adoption intentions among Gen Z. Low-risk tolerance individuals may still think about adoption if the underlining technology itself is strong enough to safeguard against cyber risks. On the other hand, without enough trust, even if those people have a higher risk profile, they won't adopt because they're afraid that something massive has been overlooked.

The multigroup analysis results between engineering and business students showed notable differences. Educational training and mindset among the two groups create differences. Results indicate that business students lean more on social influence, risk tolerance, perceived security, trust in technology and digital literacy factors that influence DFP adoption intention. On the other hand, engineering students emphasize more security, and technical trust in technology but less influenced by social factors or digital literacy alone.

Compared to broader research on general fintech adoption among Gen Z (e.g., mobile banking, digital wallets, or robo-advisors), this study highlights unique factors driving the adoption of decentralized fintech platforms (DFPs). While constructs such as digital literacy, perceived security, and social influence have been widely supported in traditional fintech contexts (Armani Dehghani et al., 2023; Shuhaiber et al., 2023), DFP adoption introduces additional complexities. For instance, trust in technology is not just trust in a provider, but is critical, as decentralized systems often lack institutional backing. This shifts the user's confidence from centralized oversight to faith in blockchain protocols, smart contracts, and transparency features. Furthermore, social influence plays an even more pronounced role due to the experimental nature of DFPs; peer reviews, influencer endorsements, and online community discourse become primary sources of validation. This is particularly relevant for Gen Z, who are both digital natives and community-driven decision-makers. Thus, while the core drivers of fintech adoption remain relevant, their expression and impact are amplified or altered in decentralized ecosystems.

5. Conclusion

Decentralized fintech platforms are redefining finance and restoring autonomy and efficiency to the people. However, regarding the platforms Gen Z prefers, cybersecurity perception has an outsized impact on motivation to use them. Gen Z collectively is a bunch of digital natives and hence responds well to social cues, which in turn means their perception of the cybersecurity landscape in a cyber risk environment is

important in determining their willingness to trust these technologies. This study explores the factors determining Gen Z adoption intentions for decentralized fintech platforms in cyber risk environments. The study integrated the TAM model and trust theory to develop the research framework. GenZ were the respondents for the survey. PLS-SEM and NCA were used to evaluate the survey responses. PLS-SEM findings showed that DL, PS, SI, RT, and T positively affected BI. Moreover, T mediates the relationship between RT and BI. However, the NCA findings found that PS, RT, SI, and T qualify as the necessary conditions for the intention to adopt decentralized fintech platforms. However, digital literacy (DL) does not qualify as a necessary condition. This study stands out as one of the rare studies to concentrate on understanding the impact of social perceptions on cybersecurity in shaping Gen Z's adoption intentions for decentralized fintech platforms. Previous research has mainly focused on fintech acceptance; however, the theoretical framework proposed in this study offers valuable insights for academics to explore the intention to adopt decentralized fintech platforms while considering cybersecurity perceptions in an emerging market. Additionally, the study included trust in technology as a mediating variable between risk tolerance and intention to use, which shows partial median, thus it adds new insights into the literature on the adoption intention of decentralized fintech platforms. In addition, multigroup analysis results showed notable differences among engineering and business students. Moreover, the study's findings will help collaboration between fintech companies, regulators, and cybersecurity experts to establish and promote standardized security measures that can enhance trust across the ecosystem and address broader social perceptions. In addition, financial technology companies should invest in targeted cybersecurity awareness campaigns for Gen Z, emphasizing the security features of decentralized platforms. Educating users about blockchain, encryption, and risk management can help reduce misconceptions and build trust.

5.1. Theoretical and practical implications

The study contributed by integrating the Trust Theory with the Technology acceptance model (TAM). On the other hand, the study provides a better understanding of how technology adoption can be approached by users who are comfortable using appliances but cognizant of security issues. This study enhances existing models by explaining how digital literacy, perceived security, social influence, trust in technology, and risk tolerance affect the cybersecurity perceptions of GenZ in order to intention to use advanced technologies like decentralized fintech platforms. Furthermore, the results that were obtained stress the importance of trust in technology as a mediator of the relationship between risk tolerance and intention to adopt decentralized fintech platforms, which helps in understanding the adoption of decentralized systems that do not have a central authority at the helm.

This study makes a methodological contribution by integrating PLS-SEM and Necessary Condition Analysis (NCA) to provide a more comprehensive understanding of adoption intention in decentralized fintech platforms. Moreover, the results were also validated by the experts in the field by employing mixed method approach. In addition, multigroup analysis were employed to explore new insights in DFP adoption intention among the student groups. PLS-SEM identifies the sufficiency-based causal relationships, uncovering key determinants that significantly predict adoption. Meanwhile, the NCA highlights the necessary conditions that must be met for adoption to occur. The use of NCA alongside PLS-SEM added an important layer of insight into the nature of the relationships in the model. While PLS-SEM identified Digital Literacy (DL) as a statistically significant predictor of Behavioral Intention (BI), NCA revealed that DL is not a necessary condition. This suggests that while digital competence enhances the likelihood of adoption, it is not a minimum threshold that must be met for adoption to occur. This is particularly relevant in the Gen Z context, where a baseline level of digital fluency is already assumed for engineering students illustrated in the multigroup analysis. In contrast, constructs like perceived security and trust in technology showed both significance and necessity for both engineering and business students, emphasizing their critical role. These findings imply that interventions aimed at increasing adoption should prioritize building trust and demonstrating security rather than solely focusing on digital skill development. By combining these methods, the study bridges a critical gap ensuring that sufficient and essential factors are considered. This dual approach enhances theoretical precision and practical applicability, offering a robust framework for fintech adoption research and guiding policymakers in cybersecurity and digital finance strategies.

The findings suggest that fintech firms, developers, and cybersecurity experts must adopt targeted strategies to enhance the adoption of decentralized fintech platforms among Gen Z. Beyond traditional security measures, digital finance platforms should implement features that visibly build trust, such as real-time security dashboards, transparent third-party audit reports, and customizable privacy controls. Developers and cybersecurity experts can introduce educational tools on wallet safety and phishing prevention, along with decentralized dispute resolution systems, can further reassure users. Given the strong influence of peer networks, platforms should also leverage influencer partnerships and gamified referral programs to cultivate social credibility. To effectively address Gen Z's cybersecurity concerns surrounding decentralized fintech platforms, awareness campaigns must be tailored to their media habits and communication preferences. Traditional formats such as brochures or webinars are less likely to engage this demographic. Instead, short-form video content on platforms like TikTok, Instagram Reels, and YouTube Shorts can be used to deliver digestible cybersecurity tips, such as identifying fake airdrops, safely managing private keys, or using cold wallets. Campaigns should employ relatable, influencer-style narratives and demonstrate real-world scenarios.

On the policy side, regulators can support adoption by introducing standardized security certifications for DFP, integrating digital finance and cyber hygiene into university curricula, and launching regulatory sandboxes for innovation. Transparency requirements and ethical guidelines for financial influencers would also enhance accountability and user protection. Together, these measures can bridge the trust gap, address security concerns, and foster a safer, more inclusive environment for decentralized fintech adoption.

5.2. Limitations and suggestions for future research

The study highlights a few limitations that suggest the development of future research avenues. First, the sample scope is limited to Generation Z respondents from private universities in Malaysia located at Klang Valley, which means that the sample does not fully reflect the broader population's attitudes and behaviors towards decentralized fintech platforms. The purposive sampling method has potential sampling bias and limited generalizability to broader populations outside Klang Valley or to students in other academic disciplines. This geographic and demographic limitation implies that the findings are unlikely to be true or applicable to other countries or older people with different technological and financial literacy degrees. Besides, the research is done mainly through self-reports, which are prone to biases connected to self-perception and answering in a socially acceptable manner. However, a common method bias test was done to reduce the bias.

Future studies may build on these findings and increase their representativeness by involving a broader and more diverse range of respondents of different ages and socio-economic groups from different parts of the world. Future studies may consider employing stratified or random sampling techniques to enhance external validity. In addition, future studies can add control variables such as prior experience with DFP, financial literacy, income level, frequency of fintech usage, and time spent using decentralized financial platforms to further strengthen model precision. Moreover, trust in technology can be used as a

moderating variable for future studies.

CRediT authorship contribution statement

Md Sharif Hassan: Writing – original draft, Methodology, Formal analysis, Conceptualization. **Nguyen Hong Mai:** Writing – original draft, Investigation, Data curation. **Nor Shaipah Abdul Wahab:** Writing – review & editing, Supervision, Methodology. **Mohammad Bin Amin:** Software, Project administration, Funding acquisition. **Md Maruf Hassan:** Writing – review & editing, Validation. **Judit Oláh:** Writing – review & editing, Visualization, Validation, Supervision, Resources, Project administration, Funding acquisition.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

This research was supported by the Project no. TKP2021-NKTA-32 that has been implemented by the Ministry of Culture and Innovation of Hungary from the National Research, Development; also supported by the University of Debrecen Program for Scientific Publication.

Appendix

Table A1
Measurement Items

Variable	Measurement Items	References
Digital Literacy (DL)	DL1: I can learn new digital platforms like decentralized fintech platforms (DFP) easily. DL2: I keep up with important new digital platforms like DFP. DL3: I know about a lot of different digital platforms like DFP. DL4: I have the technical skills I need to use digital platforms like DFP. DL5: I have good digital technology skills to use DFP.	Nikuo et al. (2022)
Social Inf00luence (SI)	SI1: People who matter to me believe that I should use the DFP. SI2: People who have an impact on my behavior believe that I should use the DFP. SI3: I expect using DFP services to be trendy. SI4: I will use DFP if people in my generation widely use these platforms.	Hassan et al. (2024) and Yan et al. (2021)
Perceived Security (PS)	PS1: I believe that DFP provides a secure environment for transactions. PS2: I feel confident that my personal and financial data are well-protected on DFP. PS3: I trust the security measures of DFP to prevent cyber threats. PS4: Using DFP does not expose me to significant cybersecurity risks.	Roh et al. (2024)
Risk Tolerance (RT)	RT1: I am willing to take financial risks when using DFP. RT2: I am comfortable using DFP even if they involve some security risks. RT3: I believe the potential benefits of DFP outweigh the possible risks.	Bansal and Bagadia (2018)
Trust in Technology (T)	T1: I trust DFP to function reliably and securely. T2: I believe that DFP are designed with users' best interests in mind. T3: I feel confident that DFP will protect my financial transactions. T4: I am comfortable relying on DFP for financial activities.	Dianty and Faturohman (2023)
Intention to Adopt DFP (BI)	BI1: I intend to adopt DFP in the future. BI2: I expect to use the DFP regularly in the future. BI3: I will strongly advise others to use the DFP.	Yan et al. (2021)

Data availability

Data will be made available on request.

References

Abou Ali, A. A. K. (2024). DeFi era: The behavioral intentions toward cryptocurrency in Lebanon. *Innovation & Management Review*. https://doi.org/10.1108/inmr-02-2023-0022

Adamek, J., & Solarz, M. (2023). Adoption factors in digital lending services offered by fintech lenders. *Oeconomia Copernicana, 14*(1), 169–212. https://doi.org/10.24136/oc.2023.005

Ahmed, S., Ahmed, R., Ashrafi, D. M., Ahmed, E., & Annamalah, S. (2024). Building trust in cybernetic payment network: Insights from an emerging economy. *Journal of Open Innovation: Technology, Market, and Complexity, 10*(3), Article 100331. https://doi.org/10.1016/j.joitmc.2024.100331

Al-Adaileh, A., Al-Kfairy, M., Tubishat, M., & Alfandi, O. (2024). A sentiment analysis approach for understanding users' perception of metaverse marketplace. *Intelligent Systems with Applications, 22*, Article 200362. https://doi.org/10.1016/j.iswa.2024.200362

Alshater, M. M., Saba, I., Supriani, I., & Rabbani, M. R. (2022). Fintech in islamic finance literature: A review. *Heliyon, 8*(9), Article e10385. https://doi.org/10.1016/j.heliyon.2022.e10385

Alsmadi, A. A., Shuhaiber, A., & Al-Omoush, K. S. (2023). Rolling the crypto dice: The interplay of legal environments, market uncertainty, and gambling attitudes on users' behavioral intentions. *Human Behavior and Emerging Technologies*, 1–17. https://doi.org/10.1155/2023/8259139, 2023.

Armani Dehghani, M., Karavidas, D., Rese, A., & Acikgoz, F. (2023). Bridging the adoption gap for cryptocurrencies: Understanding the affordances that impact approach–avoidance behavior for potential users and continuation usage for actual users. *Information Technology & People*. https://doi.org/10.1108/itp-10-2022-0821

Bansal, A., & Bagadia, P. (2018). The effect of financial risk tolerance on adoption of mobile banking in India: A study of mobile banking users. *IUP Journal of Bank Management, 17*(1), 50–76.

Bermeo-Giraldo, M. C., Valencia-Arias, A., Palacios-Moya, L., & Valencia, J. (2023). Adoption of fintech services in young students: Empirical approach from a developing country. *Economies, 11*(9), 226.

Bodo, B., & de Filippi, P. (2024). Trust in context: The impact of regulation on blockchain and DeFi. *Regulation & Governance*. https://doi.org/10.1111/rego.12637

Bommer, W. H., Milevoj, E., & Rana, S. (2023). A meta-analytic examination of the antecedents explaining the intention to use fintech. *Industrial Management & Data Systems, 123*(3), 886–909. https://doi.org/10.1108/imds-03-2022-0170

Colombo, J. A., & Yarovaya, L. (2024). Are crypto and non-crypto investors alike? Evidence from a comprehensive survey in Brazil. *Technology in Society, 76*, Article 102468. https://doi.org/10.1016/j.techsoc.2024.102468

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319–340.

Dianty, M. A., & Faturohman, T. (2023). Factors influencing the acceptance of fintech lending platform in Indonesia: An adoption of technology acceptance model. *International Journal of Monetary Economics and Finance, 16*(3–4), 371–379.

Dul, J. (2016). Necessary condition analysis (NCA): Logic and methodology of "necessary but not sufficient" causality. *Organizational Research Methods, 19*(1), 10–52.

Dul, J. (2019). *Conducting necessary condition analysis for business and management students*. Sage Publications.

Gan, Q., & Lau, R. Y. K. (2024). Trust in a 'trust-free' system: Blockchain acceptance in the banking and finance sector. *Technological Forecasting and Social Change, 199*, Article 123050. https://doi.org/10.1016/j.techfore.2023.123050

Gupta, S., Pandey, D. K., El Ammari, A., & Sahu, G. P. (2023). Do perceived risks and benefits impact trust and willingness to adopt CBDCs? *Research in International Business and Finance, 66*, Article 101993. https://doi.org/10.1016/j.ribaf.2023.101993

Hair, J., Hollingsworth, C. L., Randolph, A. B., & Chong, A. Y. L. (2017). An updated and expanded assessment of PLS-SEM in information systems research. *Industrial Management & Data Systems, 117*(3), 442–458.

Harvey, C. R., & Rabetti, D. (2024). International business and decentralized finance. *Journal of International Business Studies, 55*(7), 840–863. https://doi.org/10.1057/s41267-024-00705-7

Hassan, M. S., Islam, M. A., Abdullah, A. B. M., & Nasir, H. (2024). End-user perspectives on fintech services adoption in the Bangladesh insurance industry: The moderating role of trust. *Journal of Financial Services Marketing*, 1–19.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science, 43*, 115–135.

Javaheri, D., Fahmideh, M., Chizari, H., Lalbakhsh, P., & Hur, J. (2024). Cybersecurity threats in fintech: A systematic review. *Expert Systems with Applications, 241*, Article 122697. https://doi.org/10.1016/j.eswa.2023.122697

Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of E-Collaboration, 11*(4), 1–10.

Lazar, I. M., Panisoara, G., & Panisoara, I. O. (2020). Digital technology adoption scale in the blended learning context in higher education: Development, validation and testing of a specific tool. *PLoS One, 15*(7).

Makarov, I., & Schoar, A. (2022). Cryptocurrencies and decentralized finance (DeFi). *Brookings Papers on Economic Activity, 2022*(1), 141–215. https://doi.org/10.1353/eca.2022.0014

Mohd Nor, S., Abdul-Majid, M., & Esrati, S. N. (2021). The role of blockchain technology in enhancing Islamic social finance: The case of zakah management in Malaysia. *Foresight, 23*(5), 509–527. https://doi.org/10.1108/fs-06-2020-0058

Nikou, S., De Reuver, M., & Mahboob Kanafi, M. (2022). Workplace literacy skills—how information and digital literacy affect adoption of digital technology. *Journal of Documentation, 78*(7), 371–391.

Nilashi, M., Abumalloh, R. A., Keng-Boon, O., Wei-Han Tan, G., Cham, T.-H., & Cheng-Xi Aw, E. (2024). Unlocking sustainable resource management: A comprehensive SWOT and thematic analysis of fintech with a focus on mineral management. *Resources Policy, 92*, Article 105028. https://doi.org/10.1016/j.resourpol.2024.105028

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879–903.

Podsakoff, P. M., Podsakoff, N. P., Williams, L. J., Huang, C., & Yang, J. (2024). Common method bias: It's bad, it's complex, it's widespread, and it's not easy to fix. *Annual Review of Organizational Psychology and Organizational Behavior, 11*(1), 17–61.

Proelss, J., Sévigny, S., & Schweizer, D. (2023). GameFi: The perfect symbiosis of blockchain, tokens, DeFi, and NFTs? *International Review of Financial Analysis, 90*, Article 102916. https://doi.org/10.1016/j.irfa.2023.102916

Raddatz, N., Coyne, J., Menard, P., & Crossler, R. E. (2021). Becoming a blockchain user: Understanding consumers' benefits realization to use blockchain-based applications. *European Journal of Information Systems, 32*(2), 287–314. https://doi.org/10.1080/0960085x.2021.1944823

Ramly, F. B., & Md Zabri, M. Z. (2024). Unveiling the digital desire: UTAUT analysis of NFT investment intentions in Malaysia. *China Finance Review International, 14*(3), 630–647. https://doi.org/10.1108/cfri-06-2023-0143

Ringle, C. M., Wende, S., & Becker, J. (2024). SmartPLS 4. Bönningstedt: SmartPLS. Retrieved from https://www.smartpls.com.

Roh, T., Yang, Y. S., Xiao, S., & Park, B. I. (2024). What makes consumers trust and adopt fintech? An empirical investigation in China. *Electronic Commerce Research, 24*(1), 3–35.

Saengchote, K., Putniņš, T., & Samphantharak, K. (2023). Does DeFi remove the need for trust? Evidence from a natural experiment in stablecoin lending. *Journal of Behavioral and Experimental Finance, 40*, Article 100858. https://doi.org/10.1016/j.jbef.2023.100858

Sekaran, U., & Bougie, R. (2016). *Research methods for business: A skill building approach* (7th ed.). UK: Wiley.

Sham, R., Aw, E. C.-X., Abdamia, N., & Chuah, S. H.-W. (2023). Cryptocurrencies have arrived, but are we ready? Unveiling cryptocurrency adoption recipes through an SEM-fsQCA approach. *The Bottom Line, 36*(2), 209–233. https://doi.org/10.1108/bl-01-2022-0010

Shao, Z., Zhang, L., Brown, S. A., & Zhao, T. (2022). Understanding users' trust transfer mechanism in a blockchain-enabled platform: A mixed methods study. *Decision Support Systems, 155*, Article 113716. https://doi.org/10.1016/j.dss.2021.113716

Shmueli, G., Sarstedt, M., Hair, J. F., Cheah, J. H., Ting, H., Vaithilingam, S., & Ringle, C. M. (2019). Predictive model assessment in PLS-SEM: Guidelines for using PLSpredict. *European Journal of Marketing, 53*(11), 2322–2347.

Shuhaiber, A., Al-Omoush, K. S., & Alsmadi, A. A. (2023). Investigating trust and perceived value in cryptocurrencies: Do optimism, fintech literacy, and perceived financial and security risks matter? *Kybernetes*. https://doi.org/10.1108/k-03-2023-0435

Singh, N., & Sinha, N. (2020). How perceived trust mediates merchant's intention to use a mobile wallet technology. *Journal of Retailing and Consumer Services, 52*.

Song, Y., Sun, C., Peng, Y., Zeng, Y., & Sun, B. (2022). Research on multidimensional trust evaluation mechanism of fintech based on blockchain. *IEEE Access, 10*, 57025–57036. https://doi.org/10.1109/access.2022.3177275

Suri, A., Sharma, Y., Jindal, L., & Sijariya, R. (2024). Blockchain for data protection and cyber fraud reduction: Systematic literature review and technology adoption dynamics among Gen Y and Z. *International Journal of Quality & Reliability Management, 41*(8), 2181–2198. https://doi.org/10.1108/ijqrm-03-2023-0094

Thangavel, P., & Chandra, B. (2024). Digital immigrants versus digital natives: Decoding their E-commerce adoption behavior. *Sage Open, 14*(4), Article 21582440241282437.

Trianto, B., Nik Azman, N. H., & Masrizal, M. (2023). E-Payment adoption and utilization among micro-entrepreneurs: A comparative analysis between Indonesia and Malaysia. *Journal of Science and Technology Policy Management*. https://doi.org/10.1108/jstpm-12-2022-0207

Vučinić, M., & Luburić, R. (2022). Fintech, risk-based thinking and cyber risk. *Journal of Central Banking Theory and Practice, 11*(2), 27–53. https://doi.org/10.2478/jcbtp-2022-0012

Wronka, C. (2021). Financial crime in the decentralized finance ecosystem: New challenges for compliance. *Journal of Financial Crime, 30*(1), 97–113. https://doi.org/10.1108/jfc-09-2021-0218

Xu, R., Zhu, J., Yang, L., Lu, Y., & Xu, L. D. (2024). Decentralized finance (DeFi): A paradigm shift in fintech. *Enterprise Information Systems, 18*(9). https://doi.org/10.1080/17517575.2024.2397630

Yan, C., Siddik, A. B., Akter, N., & Dong, Q. (2021). Factors influencing the adoption intention of using mobile financial service during the COVID-19 pandemic: The role of fintech. *Environmental Science and Pollution Research, 1*(9).

Yathiraju, N., & Dash, B. (2023). Gamification of e-wallets with the use of DeFi technology: A revisit to digitization in fintech. *International Journal of Engineering, Science, Technology and Innovation, 3*(1), 1–11.

Yeong, Y.-C., Kalid, K. S., Savita, K. S., Ahmad, M. N., & Zaffar, M. (2022). Sustainable cryptocurrency adoption assessment among IT e00nt00husiasts and cryptocurrency social communities. *Sustainable Energy Technologies and Assessments, 52*, Article 102085. https://doi.org/10.1016/j.seta.2022.102085