Sustainable Futures 10 (2025) 101530

Contents lists available at ScienceDirect

Sustainable Futures

journal homepage: www.sciencedirect.com/journal/sustainable-futures

Customers' trust in Islamic banking post-cyberattack leads to digital service breakdowns in Indonesia

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ARTICLE INFO

Keywords:
Islamic banking
Mobile banking
Technology acceptance model
Service failure
Cyberattack
Trust
Perceived risk
Religiosity
SEM-PLS
MGA

ABSTRACT

This study investigates how ransomware cyberattacks on Indonesia's largest Islamic bank, Bank Syariah Indonesia (BSI), affect Muslim customers' trust and their intention to continue using BSI Mobile after the cyberattacks, leading to digital service breakdowns. This study integrates the Technology Acceptance Model (TAM) with trust and customers' low-risk perception as an extended mediator, along with perceived ease of use and perceived usefulness. To deepen understanding of the digital service failure post-cyberattack context in Islamic banking, the model also includes religious concerns about avoiding *riba* and Islamic mobile banking features as moderators, proposing a TAM-trust mediation-moderation model. A total of 388 primary data sets were collected using convenience sampling and analyzed using PLS-SEM and MGA. The findings revealed that trust is a major driver of BSI Mobile's continued use after service breakdowns post-cyberattack. Trust positively affected perceived ease of use, perceived usefulness, low-risk perception, and intention to use. Perceived usefulness and low-risk perception did not have a direct or indirect effect. Only perceived ease of use has direct and indirect effects that mediate trust and intention to use. The religious concern to avoid *riba* is a crucial moderator that strengthens the relationship between trust and low-risk perception. The Islamic features did not moderate any relationships, implying that they are not significantly distinguished from the conventional ones. This study extends the existing literature on Islamic mobile banking adoption and digital trust in the context of service failures and cyberattacks. The religious concern to avoid *riba* as a faith-based commitment partially alters conventional adoption pathways. Practically, this study suggests strategies to develop trust-building mechanisms by managing cybersecurity risks and promoting the adoption of Islamic mobile banking in Indonesia.

1. Introduction

According to the Bank of Indonesia, due to the increase in online shopping, Indonesia has experienced significant growth in digital payment transactions, reaching IDR 305.4 trillion or an increase of 43.66 % YoY, which is in line with the growth of digital banking transactions to IDR 3,468.4 trillion or a 61.80 % growth YoY in August 2021 [172,184]. Consumers' changing behavior toward online shopping has largely impacted the acceleration of mobile banking usage [162], delivering channels for cashless payments [119]. In 2021, 78 % of consumers actively use mobile banking at least once a month, up from 57 % in 2017 [196].

Driven by the development of global halal products and services [118], Islamic banking transactions are also increasing. In the past financial year 2022 to 2023, the global investments of Islamic economy companies increased by 128 % to US$25.9 billion. Over 55 % is in Islamic finance, 19.2 % is in Islamic media, 13.1 % is in Halal tourism, and 8.5 % is in Halal food, which reflects venture capital investments in tech start-ups, private equity investments, and corporate-led mergers and acquisitions. By 2026, global Islamic finance assets are expected to reach US$5.96 trillion, while Halal food and beverage spending is projected to reach US$1.89 trillion by 2027. Based on the 2023 Global Islamic Economy Indicator, Indonesia replaced the UAE and moved up to third place after Malaysia and Saudi Arabia [157].

As the country with the largest Muslim population in the world [198], Indonesia's economy operates a dual banking system, combining

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https://doi.org/10.1016/j.sftr.2025.101530
Received 12 January 2025; Received in revised form 8 November 2025; Accepted 11 November 2025
Available online 15 November 2025

Islamic banking with conventional banking [52,83]. On February 1, 2021, Indonesia made a breakthrough by merging three state-owned Islamic banks, namely BSM, BRI Syariah, and BNI Syariah, into Bank Syariah Indonesia (BSI), which manages 50 % of Islamic banking assets, making it the largest in Indonesia [146]. With IDR 353.62 trillion worth of assets in 2023, BSI is the sixth-largest bank in Indonesia, after Bank Mandiri, BRI, BCA, BNI, BTN, and CIMB Niaga [22].

BSI has strengthened its digital services with BSI Mobile, providing various features, which include payments, purchases, transfers, customers' account info, QR Code Indonesian Standard (QRIS), E-mas (gold trading), cash withdrawal, favorite (customized) menus, ATM and BSI branch locations, opening online saving accounts, top-up e-wallet and balance checking, e-commerce (scheduled transactions), locations and keyboard [25]. It also features Islamic elements, including prayer times and reminders, *Qibla* (the direction of prayer), mosque locations, Share-ZISWAF (payment for Islamic-based donations), Hajj and Umrah (Islamic pilgrimage) payments, and Hasanah (*Sharia*-based credit card) payments [179]. BSI also has the "Aisyah" chatbot as a customer's virtual assistant [25].

BSI has so far become customers' primary choice for the Islamic banking sector, with a broader reach, market share, products, and service varieties [42]. However, on May 8, 2023, customers were unable to transact through all digital services, including tellers at branch offices and ATMs. When ATMs and branch offices were back to normal, BSI Mobile still could not be used [23]. On May 10, 2023, Erick Thohir, the Minister of State-Owned Enterprises, confirmed that BSI's IT system was down and emphasized that cyberattacks must be anticipated [136].

There are 212.9 million internet users or 77 % of the Indonesian total population, with 128 % or 353.8 million cellular mobile connections, and 60.4 % or 167 million active social media users [186]. As part of daily life, social media swiftly becomes customers' primary source of product information [104], enhancing communication efficiency [67,74]. Social media serves as a way for businesses to connect and communicate with customers [17]. Hoping to decrease customer complaints, BSI announced through its Instagram that BSI Mobile will gradually recover. BSI posted that with maximum effort, all obstacles will be overcome. Netizens responded to the post with lots of negative comments [133]. BSI digital service breakdowns had led to national news reports about its networks being hit by ransomware cyberattacks [136,151].

On May 13, 2023, the Fusion Intelligence Center announced on Twitter (X) that the LockBit ransomware hacker gang claimed responsibility for the BSI digital service breakdowns. The president director of BSI, Hery Gunardi, explained that due to the cyberattack news, further proof was needed through audits and digital forensics [137]. Although most features were back to normal on May 15, 2023, BSI Mobile experienced another problem with MPN (the State Revenue Module) and SPAN (the State Budget Treasury System) service transactions [139]. On May 16, 2023, the Dark Tracer's Twitter account revealed that the LockBit ransomware hacker gang had spread BSI customers' data on the dark web and had asked BSI for a ransom of IDR 295.61 billion [139]. Responding to the data leaks issue, BSI's corporate secretary, Gunawan Hartoyo, explained that BSI had coordinated with the authorities and strengthened its banking and cybersecurity system. BSI ensured customers that it was safe to transact, and their funds and data remained safe [64].

In June 2024, Indonesia's second-largest Muslim organization, Muhammadiyah, decided to withdraw its funds from BSI and direct them to other Islamic banks. According to media reports, the withdrawn funds total more than IDR 13 trillion (US$815 million) and were taken to avoid concentration risk, contributing to the creation of healthy competition among Islamic banks [165]. On January 17 and July 6, 2024, BSI Mobile experienced another digital service breakdown, and once again, customer complaints were circulated on social media and appeared in online news [41,73]. The withdrawal of Muhammadiyah's funds from BSI and its subsequent switch to other banks can have a significant impact on BSI and the broader Islamic banking sector. According to Wahyudi & Almira [183] for organizations with strong religious or community ties, such as Muhammadiyah, withdrawing funds can influence perceptions of BSI's stability and reputation among other customers. The separation from Muhammadiyah will challenge BSI's organizational culture and customer trust relationships. However, according to Dzikri et al. [48] BSI's implementation of Customer Relationship Management (CRM) strategies has helped maintain customer satisfaction and loyalty among remaining clients. Nonetheless, losing a significant institutional partner like Muhammadiyah remains a notable challenge.

BSI's digital service breakdowns in May 2023 caused lots of customer complaints, especially on social media [23], leading to national news [14,23,133,136,151,177]. On BSI's Instagram, netizens commented that the prolonged BSI Mobile service breakdowns had broken their trust and demanded compensation [133]. Yudhistira and Talita [193] analyzed public sentiment as a reaction to BSI service breakdowns involving data collection from X (Twitter) using the Naive Bayes algorithm. With Tweet Crawler, 991 tweets were collected from May 8 to 11, 2023. It recorded 525 negative sentiments, 325 neutral sentiments, and 141 positive sentiments. An accuracy rate of 81.03 % was shown after comparing with the Google Cloud Natural Language API. It revealed that BSI service breakdowns negatively affect people's trust and happiness, potentially damaging BSI's reputation.

A ransomware cyberattack is a severe security issue. According to the Chairman of the Islamic Economics Study Forum, Abdul Gofur, BSI digital service breakdowns may cause public distrust of the Islamic economic and banking system in Indonesia [56]. Thus, it is essential to investigate customers' responses to BSI digital service breakdowns following ransomware cyberattacks in May 2023, by analyzing their trust and continuance intention to use BSI Mobile, with the Technology Acceptance Model (TAM) as the theoretical foundation.

The vast majority of studies of mobile payment adoption have primarily used TAM [34]. Empirical evidence from various TAM studies showed that perceived ease of use and usefulness have prominent roles in determining customers' acceptance of technologies across various domains, such as information technology [44], computer technology [45,46,182], e-payment [94,149], e-commerce and marketplaces [36,123,169,189], mobile banking [19,93,110], e-wallets [155,174], a sport-branded app [188], e-procurement technology [3], telecommunication technology [12,168], video on demand technology [126], e-learning [68,121], accounting education technology [11], social media [15,87,129], and food delivery apps [164].

However, some studies found that TAM has limitations in explaining customers' reasons, motives, behaviors, and social environments for technology acceptance [10,60,97]. In response to these research gaps, Ajibade [10] found that TAM needs government-perspective interaction when analyzing online shopping market environments. Napitupulu [113] and Torres & Gerhart [175] also found that TAM has not yet adopted a user-centered approach in examining the mobile adoption phenomenon. This approach focuses on user characteristics, such as self-efficacy—the users' confidence in their ability to control their motivation, behavior, and social environment — as a method of service utilization. Aisyah and Sesunan [9] also found the need for TAM to integrate subjective norms and perceived behavior control of TPB (Theory of Planned Behavior) to analyze customers' acceptance of a *Sharia*-based e-wallet.

ICT Institute's technology observer, Heru Sutadi, explained that the challenge of customer adoption of digital banking services lies in trust, and what happened to BSI may hamper the digital transformation process in society, which is very likely to cause public distrust in using digital banking services. Despite customer reliance on it, they still worried about the risk of losing funds and data privacy [151]. In digital transactions, trust is subject to service providers' actions in securing users' funds and data privacy [93,123,124,189]. Customers' trust will impact their intention to use a technology [34,116,123]. Moreover, trust

also has a positive impact on lowering customers' perceived risk [123–125,189]. Perceived risk determines the risk or the level of uncertainty in using a technology [123,124,155]. Thus, customers' low-risk perception positively affects their intention to use, and mediates the indirect relationship between trust and intention to use [123–125,189].

Due to the prolonged BSI Mobile service breakdowns, netizens through BSI's Instagram threatened to switch accounts [133]. Trust and low-risk perceptions are central to customers' continuance usage of a technology. Trust is consistently found to have a strong and positive effect on customers' intention to use and loyalty to Islamic mobile banking [21,107,120,148]. A higher level of trust increases adoption and loyalty, while a higher level of perceived risk can hinder adoption and loyalty. Customer uncertainty about the security can increase perceived risk and reduce customers' adoption of Islamic mobile banking [6,166,194]. However, some studies have found that although perceived risk can negatively impact adoption, its effect is often less direct than trust. Some studies also found that perceived risk did not significantly deter adoption if trust was high and if risk was managed through strong security and regulatory measures [6,166], which leads to research gaps. To understand how trust erosion and risk uncertainty might lead to customers permanently abandoning BSI Mobile post-cyberattack that leads to digital service breakdowns, this study integrates TAM with trust and low-risk perception, which warrants further investigation.

Previous studies found that TAM needs to integrate religiosity and *Sharia*-compliance factors to analyze Muslim customers' motives for using Islamic banking services [57,76,109,112,167,180]. Sarofim et al. [152] found that religiosity corresponded with higher levels of belief in fate, leading to lower levels of customer dissatisfaction. On BSI's Instagram, netizens commented that the breakdowns in the BSI Mobile service have caused them many disadvantages. However, they also admitted that they chose BSI for religious concerns to avoid *riba* or usury [133]. In Islamic law, interest-based products are strictly forbidden and considered exploitative. Islamic banking and financial institutions provide *Sharia*-compliant alternatives to conventional interest-based products, including mobile applications, which are structured to avoid any form of *riba* [108]. Multiple studies found that Muslims with a strong concern for *riba* prohibition are more likely to choose Islamic banking and financial services over conventional ones [51,131]. Newton et al. [114] found that the presence of religious symbols can lead individuals to soften their evaluations of a personally experienced service failure encounter. This impact emerges through the activation of forgiveness. However, it is only among those with a religious upbringing. The impact depends on the nature of the service failure recipient. If the recipient is perceived as vulnerable, this can harden evaluations of the service failure encounter. Thus, it warrants further investigation to determine whether customers' spiritual fidelity, especially their desire to avoid *riba*, can outweigh the negative impact of functional failures experienced with BSI Mobile after the cyberattack.

Besides *riba*, Islamic banking also avoids *gharar* (excessive uncertainty), *maysir* (gambling), *tadlis* (fraud), *riswah* (bribery), and *isyraf* (extravagance) in its products and services [49]. Customers use Islamic mobile banking for its convenience, especially for facilitating Islamic social payments [13], such as *infaq* (charitable donations) and *zakat* (almsgiving) [108]. To meet the Muslim lifestyle as its primary target, it also provides other Islamic features like prayer time reminders and *Qibla* direction [111,178]. Although Mutia Hendarti et al. [111] and Ulya et al. [178] found that Islamic features may distinguish Islamic mobile banking from conventional ones, none of the previous studies specifically analyzed whether these features positively influence customers' perceived usefulness or usage intention, leading to a research gap that requires further investigation.

This study integrates TAM with trust and low-risk perception. Both positively impact customer intention to use. As a mediator, along with perceived ease of use and usefulness, low-risk perception mediates the indirect effect of trust on intention to use. Additionally, this study incorporates customers' religious concerns about avoiding *riba* and Islamic mobile banking features as moderators into the model. Religiosity has a significant influence on the adoption of Islamic mobile banking. Muslims are more likely to use it when it is easy to use, useful, and aligns with Islamic values. Islamic banks ensure that their mobile banking services comply with Islamic law and cater to Muslims' religious needs, such as ZISWAF payments or prayer-related features [167]. The religious concern to avoid *riba* uniquely moderates the relationship between trust and low-risk perception, as well as the relationship between low-risk perception and intention to use. Islamic mobile banking features may also moderate the relationships between trust and perceived usefulness, as well as between perceived usefulness and intention to use. The lack of TAM studies integrating trust and the mediation-moderation model in the context of service failures following cyberattacks in Islamic mobile banking makes this research novel.

As the real-world events in the digital transformation of Islamic banking in Indonesia, the sensitivity of cyberattack impacts on the adoption of its mobile banking services, and the lack of studies examining TAM that incorporate trust and religiousity within Islamic banking, particularly following a cyberattack-induced service breakdowns, this study aims to fill the research gaps with the extended model of the TAM-trust mediation-moderation framework. In the proposed model, customer low-risk perception, along with perceived ease of use and usefulness, mediates the indirect effect of trust on intention to use. As mediators, the religious concern to avoid *riba* moderates the relationships between trust and low-risk perception, as well as between low-risk perception and intention to use. The Islamic mobile banking features moderate the trust and perceived usefulness relationship, as well as the perceived usefulness and intention-to-use relationship. This study addresses the following research objectives: (1) to analyze the integration of TAM with trust and to examine trust's effect on other factors, (2) to analyze what factors influence customer continuance intention to use BSI Mobile after service breakdowns post-cyberattack, (3) to analyze the role of mediators, and (4) the role of moderators in the proposed model.

This study presents a theoretically transformative contribution to Islamic banking and digital trust literatures by extending the TAM theoretical base with trust, low-risk perception, and the mediation-moderation framework to understand customer adoption of Islamic mobile banking in the context of cyberattacks and service failures. Based on the findings and implications, this study proposes strategies for managing customer trust, cybersecurity risks, and mobile banking adoption, making practical contributions to the digital transformation of Islamic banking in Indonesia.

The remaining paper is organized as follows: Section 2 discusses the theoretical review of previous studies on factors, their relationships, and hypothesis development. Section 3 discusses the research method. Sections 4 and 5 consist of results and discussions. Sections 6 and 7 discuss the theoretical contribution and practical implications. Section 8 discusses limitations and outlines future research directions.

2. Theoretical and hypotheses development of the TAM-trust mediation-moderation model

2.1. The technology acceptance model (TAM)

The technology acceptance model was developed by Davis [44], who adopted the Theory of Reasoned Action (TRA) by Fishbein and Ajzen [53]. TRA is a well-established model that broadly explains customer intention and actual behavior regarding the purchase or use of products and services. TAM has two factors: perceived ease of use and usefulness, which affect users' acceptance of new technologies [44–46,182]. Customer acceptance of a technology can be defined as a situation in which a customer is interested in using digital services from a service provider [9–11,110,123,155,174]. Knowing customers' intentions is

important for service providers in predicting customers' demand. Customer acceptance is measured by their intention to do another transaction in the future, use it frequently, and have no intention to stop engaging with the service [53,91,94]. Based on TAM, customers' acceptance or rejection of using BSI Mobile after service breakdowns following a cyberattack is driven by perceived ease of use and usefulness.

Perceived ease of use refers to the difficulty or effort required by customers to use a technology, encompassing factors such as ease of learning, flexibility, understandability, and controllability [38,44,116]. Multiple studies across various domains have indicated that perceived ease of use is a strong predictor of intention to use. Yang et al. [191] found that effort expectancy, or perceived ease of use, plays a crucial role in influencing user intention to use a gamified mobile wallet. Perceived ease of use is a crucial factor in the adoption of mobile health services by older users [195]. Perceived ease of use can be considered as a salient indicator of e-commerce acceptance [18]. As a cognitive instrumental process, perceived ease of use influenced user acceptance of Information Technology in the workplace [182]. Perceived ease of use determines the subscribers' intention to use 3 G mobile services [168]. Users may reject a digital service requiring too much effort [116].

Moreover, perceived ease of use is better with the support of perceived usefulness [191]. The more straightforward the technology is, the more useful it is, providing users with benefits in carrying out specific tasks [182,191]. Thus, perceived ease of use positively affects both perceived usefulness and users' intention to use [11,45,93,123,182]. Perceived usefulness refers to customers' perception of a technology's performance. Perceived usefulness has a substantial impact on customers' intention to use. It indicates the degree to which customers believe that the technology will enhance their activities, job performance, and productivity [9,44,45,94,99,116,189]. The ability to utilise and personalize the services leads to satisfaction [8]. Satisfied customers develop a favorable intention to continue using the product or service. They firmly believe that the technology has more advantages, has more features, is more effective, and is faster than other similar technologies [24,116,117,155]. These present the following hypothesis:

H1. Perceived ease of use positively affects perceived usefulness.

H2. Perceived ease of use positively affects continuance intention to use.

H3. Perceived usefulness positively affects continuance intention to use.

2.2. The integration of trust and low-risk perception in TAM

Another user's primary concern in accepting digital services is that they will only use it from a trustworthy provider [34,116]. Due to cyberattacks and service failures, users may encounter issues that pose security and privacy risks. To resolve these issues, TAM must integrate trust and low-risk perception to analyze users' continuance intention to use the services. Trust represents users' belief that the service provider is reliable and trustworthy [55], responsible [34], benevolent [65,93], constantly fulfill its obligations and promises, and does not exploit users' vulnerabilities, bringing confidence in the quality of service [55,72].

When users trust a particular online store, they believe that the store is safer compared to other stores [123]. Trust builds good relationships with the service provider [55] and strongly influences their intention to use [34,116,120,123]. While perceived risk represents uncertainty or potential failure to meet the intended goals in using a technology, referring to security and privacy risk [85,135], making potential risks outweigh the benefits [123,124,155]. If users have a low-risk perception of using a technology, it will positively affect their intention to use it [18,30,69,123–125,159,189]. A higher level of trust reduces perceived risk. Thus, trust has a positive effect on the perception of low risk associated with using a technology. Low-risk perception also mediates the indirect effect of trust on intention to use [123–125,189]. These present the following hypothesis:

H4. Low-risk perception positively affects continuance intention to use.

H5. Trust positively affects continuance intention to use.

H6. Trust positively affects low-risk perception.

In the TAM-trust integration model, trust positively impacts perceived ease of use and usefulness. It involves reducing the time and effort required for users to execute a service by fostering confidence in the provider's reliability and promises, resulting in a smoother and more effortless experience [123,189]. Trust also positively impacts perceived usefulness, shaping users' perceptions of the intended services' usefulness. Trust reflects users' confidence in the service provider's ability to guarantee that they gain the expected usefulness as promised from using the service [123,189]. These present the following hypothesis:

H7. Trust positively affects perceived ease of use.

H8. Trust positively affects perceived usefulness.

2.3. The mediation factors in the TAM-trust model

Trust has been associated with mediating positive perceptions of the technology that stimulate users' intention to use. In the TAM-trust mediation model, perceived ease of use, usefulness, and risk are the intervening variables that mediate the indirect effect of trust on intention to use a technology. The mediation of perceived ease of use reflects trust in technology's flexibility and responsiveness, which stimulates intention to use [123,189]. The mediation of perceived usefulness reflects trust in technology's usability, effectiveness, and good service quality, which stimulates intention to use [123,189]. The mediation of low-risk perception reflects trust in the service provider's ability to prevent potential financial loss and data leakage, making the benefit of using the service outweigh the risk. Low-risk perception stimulates intention to use [123–125,189]. The higher the trust, the less risky, the easier, and the more useful the technology is, the higher the intention to use it [123]. These present the following hypothesis:

H9. Perceived ease of use mediates the trust's indirect effects on intention to use.

H10. Perceived usefulness mediates the trust's indirect effects on intention to use.

H11. Low-risk perception mediates the trust's indirect effects on continuance intention to use.

2.4. The religiosity moderation factors in the TAM-trust mediation model

Previous studies on digital services of Islamic banking and finance found the need to integrate the religiosity factor to analyze Muslim customers' usage behavior [49,51,57,76,109,112,166,167,178,180]. In the context of service failures, Tsarenko & Tojib [176] found the need to integrate customer personality characteristics of religiosity into the model, revealing a strong and positive effect on customer emotional and decisional forgiveness in response to service failure experience. The study of Casidy et al. [33] indicates the effects of religion on consumer behavior, which demonstrated the importance of religion as a strategic variable in managing service failure. Newton et al. [114] found that although religious symbols can soften evaluations of service failures among customers with a religious upbringing by activating forgiveness, this effect will reverse if the victim is seen as vulnerable and if the failure is observed rather than from personal experience.

Multiple studies confirm that the motivation to avoid *riba* has a pivotal impact on Muslims' decision to use Islamic banking and financial services. Muslims with a strong understanding of *riba* and its prohibition in Islam are more likely to choose Islamic banking and financial services over conventional ones [51,77,131], as seen in religious communities and leaders [77]. To explore whether religiosity may become a pivotal psychological mechanism that buffers customers' distrust of BSI Mobile after service breakdowns following the May 2023 cyberattack, this study incorporates the religious factor of avoiding *riba* into the model. As a moderator, it may strengthen the relationship between trust and low-risk perception, as well as the relationship between low-risk perception and intention to use. Thus, this study develops the following hypothesis:

H12. The religious factor moderates the trust and low-risk perception relationship, and the impact is higher for customers with religious concerns in avoiding *riba*.

H13. The religious factor moderates the low-risk perception and intention to use relationship, and the impact is higher for customers with religious concerns in avoiding *riba*.

Islamic banking offers *Sharia*-compliant alternatives to conventional interest-based products, incorporating Islamic values into its offerings, including mobile banking. All its features are structured to avoid any form of *riba*, which is considered exploitative and strictly forbidden in Islamic law. This is achieved by excluding interest-based products and ensuring all transactions are *Sharia*-compliant [108]. Many Islamic banks' mobile banking services offer Islamic features, such as *Qibla* direction, prayer time reminders, access to the al-Quran, *d'zikir*, and daily *du'a* [197], to support Muslims' spiritual routines [111,178]. Features like *zakat* (almsgiving) and *infaq* (charitable donations) are also integrated into mobile banking to promote ethical finance and social welfare [108], alongside their financial activities [111,178], reflecting Islamic values [108].

Although such features distinguish Islamic mobile banking from conventional options and meet the unique needs of Muslims' spiritual activities as its primary target audience [111,178], none of the reviewed studies explicitly mentions that these Islamic features impact perceived usefulness and usage behavior. To explore whether Islamic features may uniquely influence customers' tolerance for BSI Mobile service failures following a cyberattack, this study incorporates Islamic features (e.g., ZISWAF donations, prayer reminders) into the model. As a moderator, it may strengthen the trust and perceived usefulness relationship, as well as the perceived usefulness and intention to use relationship. Thus, this study develops the following hypothesis:

H14. Islamic features moderate the trust and perceived usefulness relationship, and the impact is higher for customers who often use Islamic features on BSI Mobile.

H15. Islamic features moderate the perceived usefulness and intention to use relationship, and the impact is higher for customers who often use Islamic features on BSI Mobile.

This research proposes the TAM-trust mediation-moderation model to investigate how ransomware cyberattacks lead to digital service breakdowns, which may reduce Muslim customers' trust and cause them to abandon BSI Mobile. The model analyzes the direct and mediation effects among variables, as well as the significant differences in specific-group parameters that serve as moderation variables (Fig. 1).

3. Methods

The structural equation modeling - partial least squares (SEM-PLS) analysis was used to analyze the hypotheses. It can analyze complex models with multiple independent and dependent variables, can be used for reflective and formative constructs, and can manage multicollinearity problems. The results remain robust despite the presence of missing data, a small sample size, or an abnormal data distribution [61,153]. This study also employed multigroup analysis (MGA) for moderation tests to examine whether the predefined data groups between two variables exhibit significant differences in group-specific parameters [141].

The questionnaires were distributed to respondents living in Jabodetabek (Jakarta, Bogor, Depok, Tangerang, and Bekasi). The Jabodetabek region is selected as the sample set of population, since digital banking in Indonesia has grown rapidly over the past five years, with millions of users in major cities, primarily in Jabodetabek, demonstrating a 158 % increase in digital transactions [28]. Jabodetabek is also the most populous region in Indonesia, with over 30 million people (11 % of the national population), and serves as the country's primary

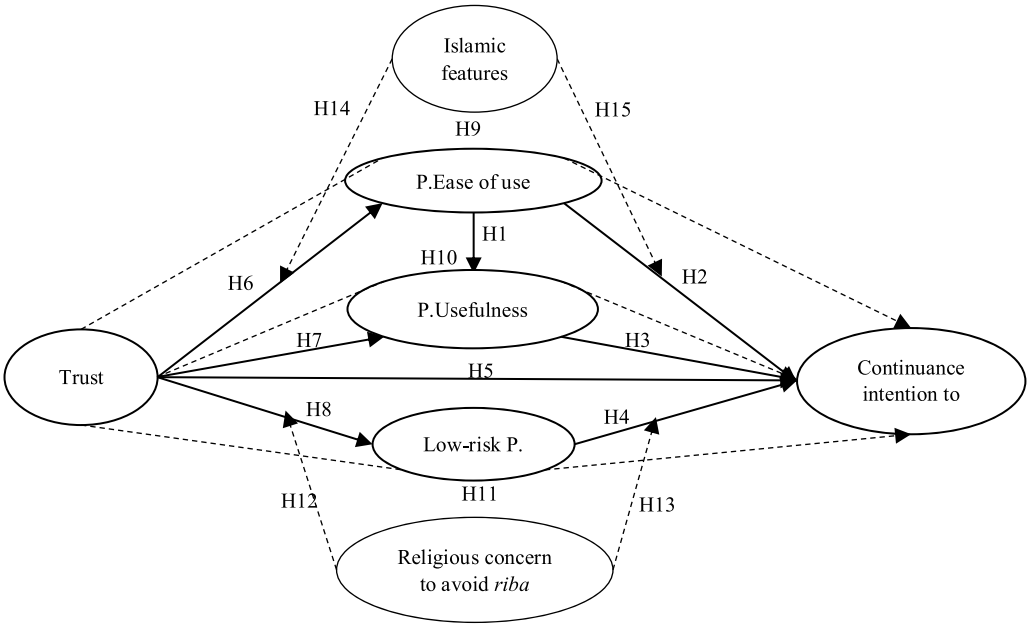

Fig. 1. The TAM-trust mediation-moderation model.

hub for government, culture, education, economy, finance, manufacturing, and commerce, with Jakarta as the core city and the surrounding areas acting as residential and supporting zones [32,145].

Based on 2023 data from the Central Statistics Agency, there are 34 million people in Jabodetabek [27]. Using the sample size formula for a survey with a 95 % confidence level, 5 % margin of error, and 50 % population proportion or standard deviation, it required 385 samples [150]. 425 questionnaires were delivered to the potential respondents. After screening 404 collected data, 16 must be eliminated due to incomplete data. With the convenience sampling technique, 388 samples were used to analyze the model.

A Likert scale with five categories of responses determined the degree of approval or disapproval of each variable, from 1 as strongly disagree to 5 as strongly agree [154]. This study employed two categorical or binary dummy variables, each representing a single-item construct, to assess moderating factors. The values of 0 or 1 were assigned to these categories [29].

Data were collected from June 15 to December 7, 2023. All participants provided informed consent before taking part in the study, and no published data can be linked to any individuals. There was no anticipated psychological distress, as all questions were designed to focus on behavioral intentions without triggering traumatic memories related to the cyberattack. Respondents are all Muslims, have had BSI savings, have used BSI Mobile for at least a year, experienced the BSI digital service breakdown from May 8 to 11, 2023, and are aware of the news about the BSI network being hit by a ransomware cyberattack. Moreover, this study must analyze the common method bias (CMB) as a single instrument with a self-reported design.

4. Results

4.1. Comment method bias

This study used two statistical approaches to analyze the common method bias (CMB). First, Harman's single-factor test, which required the variance extracted to be below the threshold value of 50 % [128,181]. Second, the highest full collinearity variance inflation factor (FCVIF) test in SEM-PLS, which is required to be below the threshold value of 3.3 [90]. Table 1 shows that, based on Harman's single-factor test, the variance extracted was 38.49 %, which is less than the threshold of 50 %, indicating that the data were free from common method bias problems. Table 2 shows that, based on the highest FCVIF test in SEM-PLS, the highest value is 2.206, which is less than the threshold of 3.3, indicating that common method bias is not present in the data.

4.2. Respondent descriptions

Table 3 shows that most respondents have used BSI Mobile for over 2 years (59.6 %). 76.8 % are Millennials (age 27 to 42 years old). Most users of BSI Mobile check their balance twice to five times a month (72 %), with a notable preference for checking their balance (69 %). 95 % of them have conventional bank savings. 42 % have other Islamic savings and mobile banking. 83 % of them prefer to use an e-wallet mainly because of its integration with other services (60 %), especially online transportation (59 %) and online shopping (31 %). 92 % of respondents have e-wallets on their smartphones (36 % use Gopay, 25 % use ShopeePay, and 23 % use OVO). 2 % of respondents stopped using BSI Mobile after service breakdowns following the cyberattack, whereas 1.3 % have switched to BCA Syariah and Bank Muamalat.

4.3. Outer model

Several steps must be taken to test the model. The first step is to estimate the outer model using convergent validity tests, which require a loading factor and composite reliability of greater than 0.7, an average variance extracted (AVE) of greater than 0.5, and a Cronbach's alpha of greater than 0.7. The next step is the discriminant validity tests. Whether the construct has an adequate discriminant can be determined by comparing the cross-loading factor of the intended construct, which has to be greater than that of other constructs [2,37,153]. Table 4 shows that the convergent validity tests of loading factors, Cronbach's alpha, and composite reliability are valid (>0.7). All AVEs are valid (>0.5). The discriminant validity test result of cross-loadings in Table 5 shows that each construct is valid (greater than the other constructs). Table 6 shows that the square root AVE is greater than the latent variable correlation of one construct to other constructs.

Table 7 shows that the Fornell-Larker Criterion is greater between constructs [1,54]. Table 8 shows that the Heterotrait-Monotrait Ration (HTMT) between constructs is <0.9. Thus, all have good convergent

Table 1
Total variance explained.

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.428	40.992	40.992	8.854	38.494	38.494
2	1.744	7.582	48.574			
3	1.468	6.381	54.955			
4	1.265	5.502	60.456			
5	1.038	4.511	64.967			
6	.993	4.316	69.284			
7	.956	4.155	73.438			
8	.701	3.046	76.484			
9	.641	2.787	79.272			
10	.553	2.402	81.674			
11	.525	2.281	83.956			
12	.461	2.004	85.960			
13	.426	1.850	87.810			
14	.414	1.800	89.611			
15	.349	1.516	91.126			
16	.339	1.474	92.601			
17	.311	1.351	93.952			
18	.283	1.229	95.181			
19	.249	1.083	96.264			
20	.248	1.077	97.341			
21	.221	.961	98.302			
22	.215	.936	99.237			
23	.175	.763	100.000			

Table 2
FCVIF values.

	Ease	Features	Intent	Mod_ftr T*U	Mod_ftr U*I	Mod_rlg R*I	Mod_rlg T*R	Religios	Risk	Trust	Useful
Ease			2.206								1.651
Features			1.227								1.006
Intent											
Mod_ftr T*U											1.005
Mod_ftr U*I			1.227								
Mod_rlg R*I			1088								
Mod_rlg T*R									1.049		
Religiosity			1.087						1.051		
Risk			1.534								
Trust	1.000		1.955						1.014		1.650
Useful			2.184								

Table 3
Respondent characteristics.

Characteristics	Freq.	%	Characteristics	Freq.	%
Use BSI Mobile for:			*Gender:*		
1 - 2 years	157	40.4	Male	196	50.5
>2 years	231	59.6	Female	192	49.5
Age:			*Frequency of using BSI Mobile a month:*		
≤18	3	0.8	< 1 time	12	3
>18–27	25		1 time	81	21
>27–42	298	6.4	2–5 times	279	72
>42–56	51	76.8	6–10 times	12	3
>56	11	13	>10 times	4	1
Reasons for using Islamic banks:			*The most used BSI Mobile feature:*		
Avoid *riba*	341	88	Balance check	268	69
Payroll	27	7	Transfer	56	14.4
Profitable	12	3	Payment	26	6.7
Other	8	2	Purchase	19	5.1
			E-commerce	2	0.5
			Ziswaf (donation)	4	1
			Prayer time	13	3.3
Have a conventional bank savings account:			*The most used financial app:*		
Yes	367	95	Islamic bank mobile app	19	5
No	21	5	Conventional bank mobile app	47	12
			E-wallet	322	83
Prefer to use the most used app because:			*Use the most used app primarily for:*		
Integrates with other apps/ services	233	60	Online transportation	229	59
Sales promotion	71	18	Online shopping	120	31
Lower fees	66	17	Monthly payments	23	6
Other	18	5	Donations	2	0.5
			Other	14	3.5
Have e-wallets on phone:			*The most used e-wallet:*		
Yes	358	92	Gopay	140	36
No	30	8	Shopeepay	97	25
			OVO	99	23
			Other	22	3
			Not use e-wallet	30	8
Have another Islamic bank savings before			*Use another Islamic m-banking before the breakdown:*		
the breakdown:			Muamalat DIN	104	27
Yes	163	42	BCA Syariah mobile	32	8
No	225	58	BTNS mobile	18	4.6
			Maslahah mobile (BJB Syariah)	6	1.6
			Other Islamic bank	3	0.8
			No	225	58
Stop using BSI Mobile after the breakdown:			*Switch to another Islamic bank after the breakdown:*		
Yes	7	2	BCA Syariah	3	0.8
No	381	98	Muamalat	2	0.5
			No	383	98.7

Table 4
Convergent validity.

Indicators	Factor loadings	Cronbach's alpha	Composite reliability	AVE
Perceived ease of use		0.830	0.880	0.596
E1. BSI Mobile is easy to learn.	0.826			
E2. BSI Mobile is controllable.	0.830			
E3. BSI Mobile is clear or understandable.	0.752			
E4. BSI Mobile is flexible or easy to set up.	0.743			
E5. BSI Mobile is easy to use.	0.704			
Perceived usefulness		0.855	0.902	0.697
U1. BSI Mobile can help me be more productive with my time.	0.931			
U2. BSI Mobile is effective.	0.908			
U3. BSI Mobile is fast to transact.	0.913			
U4. BSI Mobile is useful.	0.931			
Trust		0.896	0.920	0.658
T1. BSI is reliable.	0.795			
T2. BSI is trustworthy.	0.811			
T3. BSI can fulfill its obligation.	0.838			
T4. BSI is responsible.	0.824			
T5. BSI is benevolence.	0.797			
T6. BSI would never take advantage of its customers.	0.802			
Low-risk perception		0.837	0.902	0.755
R1. BSI Mobile has a low risk of financial loss.	0.900			
R2. BSI Mobile has a low risk of data leakage.	0.872			
R3. BSI Mobile's risks are lower than its potential benefits.	0.835			
Continuance intention to use		0.906	0.941	0.841
I1. I intend to keep using BSI Mobile.	0.931			
I2. I have no intention to stop using BSI Mobile.	0.908			
I3. I intend to use BSI Mobile regularly.	0.913			
Rlg. I use BSI Mobile for religious concerns to avoid *riba*.	1.000	1.000	1.000	1.000
Ftr. I primarily use BSI Mobile's Islamic features.	1.000	1.000	1.000	1.000

Table 5
Cross loading.

	Ease	Intent	Risk	Trust	Useful	Mod_rlg R*I	Mod_ftr T*U	Mod_rlg T*R	Mod_ftr U*I	Ftr	Rlg
E1	**0,826**	0,447	0,437	0,541	0,544	0,121	0,016	0,087	−0,059	−0,002	−0,049
E2	**0,830**	0,424	0,361	0,468	0,574	−0,010	−0,020	0,042	−0,073	−0,008	−0,118
E3	**0,752**	0,386	0,321	0,373	0,415	−0,047	−0,005	0,013	−0,015	0,019	−0,083
E4	**0,743**	0,454	0,331	0,485	0,466	0,049	0,005	0,080	−0,001	0,019	−0,075
E5	**0,704**	0,406	0,424	0,525	0,599	0,029	0,002	0,028	0,018	0,096	−0,148
I1	0,507	**0,931**	0,345	0,530	0,387	0,052	−0,065	−0,012	−0,060	0,047	−0,083
I2	0,504	**0,908**	0,324	0,480	0,404	0,055	−0,115	−0,013	−0,057	0,031	−0,049
I3	0,504	**0,913**	0,325	0,569	0,390	0,053	−0,012	−0,011	0,043	0,042	−0,076
R1	0,414	0,329	**0,900**	0,416	0,420	0,018	0,004	0,121	−0,092	−0,028	−0,096
R2	0,411	0,288	**0,872**	0,459	0,444	0,073	−0,017	0,079	−0,017	0,029	−0,099
R3	0,452	0,324	**0,835**	0,444	0,507	−0,054	0,041	0,165	−0,079	0,046	−0,064
T1	0,536	0,477	0,411	**0,795**	0,478	0,036	−0,007	0,036	−0,041	0,040	−0,056
T2	0,548	0,401	0,396	**0,811**	0,497	0,150	0,045	0,009	−0,060	−0,042	−0,021
T3	0,561	0,488	0,434	**0,838**	0,504	0,141	−0,022	0,077	−0,040	0,031	−0,091
T4	0,463	0,498	0,382	**0,824**	0,423	0,098	0,025	0,059	0,005	0,001	−0,116
T5	0,443	0,441	0,431	**0,797**	0,529	0,122	0,035	0,107	0,001	−0,020	−0,059
T6	0,496	0,494	0,407	**0,802**	0,485	0,096	0,027	0,040	0,030	0,035	−0,043
U1	0,567	0,354	0,440	0,488	**0,815**	−0,001	−0,037	0,065	−0,029	0,053	−0,119
U2	0,565	0,340	0,426	0,488	**0,851**	0,038	0,010	0,009	−0,049	0,071	−0,134
U3	0,615	0,352	0,449	0,506	**0,867**	0,010	0,051	0,045	0,015	0,039	−0,094
U4	0,525	0,386	0,443	0,520	**0,805**	0,053	−0,086	0,065	−0,066	0,006	−0,061
Risk*Religious	0,042	0,058	0,014	0,132	0,030	**1,000**	0,013	0,219	0,005	0,021	0,235
Trust*Features	0,000	−0,068	0,011	0,020	−0,018	0,013	**1,000**	0,051	0,490	0,067	0,013
Trust*Religious	0,067	−0,013	0,141	0,068	0,055	0,219	0,051	**1,000**	0,025	0,016	0,199
Useful*Features	−0,035	−0,025	−0,072	−0,022	−0,038	0,005	0,490	0,025	**1,000**	0,421	0,041
ftr	0,033	0,044	0,018	0,010	0,051	0,021	0,067	0,016	0,421	**1,000**	0,050
rlg	−0,124	−0,076	−0,099	−0,079	−0,122	0,235	0,013	0,199	0,041	0,050	**1,000**

Table 6
Latent variable correlation.

	√AVE	Ease	Ftr	Intent	Mod_ftr T*U	Mod_ftr U*I	Mod_rlg R*I	Mod_rlg T*R	Rlg	Risk	Trust	Useful
Ease	0,772	1,000	0,033	0,550	0,000	−0,035	0,042	0,067	−0,124	0,490	0,627	0,681
Features	1,000	0,033	1,000	0,044	0,067	0,421	0,021	0,016	0,050	0,018	0,010	0,051
Intent	0,917	0,550	0,044	1,000	−0,068	−0,025	0,058	−0,013	−0,076	0,361	0,575	0,429
Mod_ftr T*U	1,000	0,000	0,067	−0,068	1,000	0,490	0,013	0,051	0,013	0,011	0,020	−0,018
Mod_ftr U*I	1,000	−0,035	0,421	−0,025	0,490	1,000	0,005	0,025	0,041	−0,072	−0,022	−0,038
Mod_rlg R*I	1,000	0,042	0,021	0,058	0,013	0,005	1,000	0,219	0,235	0,014	0,132	0,030
Mod_rlg T*R	1,000	0,067	0,016	−0,013	0,051	0,025	0,219	1,000	0,199	0,141	0,068	0,055
Religious	1,000	−0,124	0,050	−0,076	0,013	0,041	0,235	0,199	1,000	−0,099	−0,079	−0,122
Risk	0,869	0,490	0,018	0,361	0,011	−0,072	0.014	0,141	−0,099	1,000	0,506	0,527
Trust	0,811	0,627	0,010	0,575	0,020	−0,022	0,132	0,068	−0,079	0,506	1,000	0,600
Useful	0,835	0,681	0,051	0,429	−0,018	−0,038	0,030	0,055	−0,122	0,527	0,600	1,000

Table 7
Fornell-larcker criterion.

	Ease	Ftr	Intent	Mod_ftr T*U	Mod_ftr U*I	Mod_rlg R*I	Mod_rlg T*R	Rlg	Risk	Trust	Useful
Ease	0,772										
Features	0,033	1,000									
Intent	0,550	0,044	0,917								
Mod_ftr T*U	0,000	0,067	−0,068	1,000							
Mod_ftr U*I	−0,035	0,421	−0,025	0,490	1,000						
Mod_rlg R*I	0,042	0,021	0,058	0,013	0,005	1,000					
Mod_rlg T*R	0,067	0,016	−0,013	0,051	0,025	0,219	1,000				
Religious	−0,124	0,050	−0,076	0,013	0,041	0,235	0,199	1,000			
Risk	0,490	0,018	0,361	0,011	−0,072	0,014	0,141	−0,099	0,869		
Trust	0,627	0,010	0,575	0,020	−0,022	0,132	0,068	−0,079	0,506	0,811	
Useful	0,681	0,051	0,429	−0,018	−0,038	0,030	0,055	−0,122	0,527	0,600	0,835

consistency and can be distinguished from other constructs [132].

4.4. Inner model

Table 9 shows that the $R1^2$ of perceived ease of use is 39.2 %, which is explained by trust. The $R2^2$ of low-risk perception is 26.9 %, also explained by trust. The $R3^2$ of perceived usefulness is 51 %, which is explained by trust and perceived ease of use. The $R4^2$ of intention is 38 %, explained by trust, low-risk perception, perceived ease of use, and perceived usefulness, while other variables outside the model are explained at 59.9 %. The Q^2 predictive relevance ($Q^2 = 1 - [(1\text{-}R1^2)\ (1\text{-}R2^2)\ (1\text{-}R3^2)\ (1\text{-}R4^2)] = 1 - [(0.8463)\ (0.9276)\ (0.9974)\ (0.8556)] = 1 - 0.699 = 0.33$ (greater than zero), which indicates that the exogenous variables are suitable as predictors of endogenous variables.

The goodness of fit is 0887 (Gof = $\sqrt{\text{mean AVE x mean } R^2} = \sqrt{0.8679 \times 0.9067} = \sqrt{0.7869} = 0.887$), suggesting a large fit (>0.36) [187]. Table 10 shows a greater estimated value of SRMR, D-ULS, D-G, and NFI compared to the saturated value, indicating acceptable fit to the

Table 8
Heterotrait-monotrait ration.

	Ease	Ftr	Intent	Mod_ftr T*U	Mod_ftr U*I	Mod_rlg R*I	Mod_rlg T*R	Rlg	Risk	Trust	Useful
Ease											
Features	0,041										
Intent	0,633	0,046									
Mod_ftr T*U	0,014	0,067	0,073								
Mod_ftr U*I	0,048	0,421	0,061	0,490							
Mod_rlg R*I	0,073	0,021	0,061	0,013	0,005						
Mod_rlg T*R	0,071	0,016	0,014	0,051	0,025	0,219					
Religious	0,135	0,050	0,079	0,013	0,041	0,235	0,199				
Risk	0,582	0,043	0,415	0,026	0,079	0,061	0,153	0,109			
Trust	0,718	0,037	0,637	0,035	0,038	0,140	0,071	0,084	0,583		
Useful	0,799	0,055	0,488	0,060	0,052	0,033	0,060	0,132	0,622	0,685	

Table 9
R-square.

	R Square Adjusted	R^2	$(1-R^2)$
P.Ease of use (R1)	0.392	0.1537	0.8463
P. Risk (R2)	0.269	0.0724	0.9276
P. Usefulness (R3)	0.510	0.0026	0.9974
Intention (R4)	0.380	0.1444	0.8556

Table 10
Model fit.

	Saturated Model	Estimated Model
SRMR	0.055	0.070
d_ULS	0.827	1.365
d_G	0.364	0.388
NFI	0.840	0.834

data. The standardized root mean residual (SRMR) is 0.07, indicating a good fit ($0 > \text{SRMR} < 1$). The normed fit index (NFI) is 0.834, indicating a marginal fit ($0 > \text{NFI} < 1$) [43].

This research used a significance level of p-values < 0.05. Table 11 shows that all direct effects are significant, except for perceived usefulness and low-risk perception toward intention to use, which supports H1, H2, H5, H6, H7, and H8, and rejects H3 and H4. Table 12 shows that only perceived ease of use mediates the indirect effect of trust on intention to use. Table 13 shows that only religious concern to avoid *riba* moderates the relationship between trust and low-risk perception.

Table 14 shows that, based on multigroup analysis (MGA), the moderation effect is only present in the relationship between trust and low-risk perception. The impact is higher for customers with religious concerns to avoid *riba* than for the non-religious concern group, supporting H12 and rejecting H13. Fig. 2 shows that the first line is at 1-standard deviation below the mean with less religious concern, the second line is at the mean, and the third line is at 1-standard deviation above the mean with more religious concern. Thus, religious concern to avoid *riba* positively moderates the relationship between trust and low-risk perception. Table 15 shows that Islamic features did not moderate any relationships, rejecting H14 and H15.

Table 11
Direct effects.

Direct	Original Sample	Sample Mean	Standard Deviation	*T* Statistics	*P* Values
H1. Ease -> Useful	0,501	0,502	0,058	8,650	0,000*
H2. Ease -> Intent	0,319	0,310	0,074	4,313	0,000*
H3. Useful -> Intent	−0,035	−0,039	0,071	0,498	0,619
H4. Risk -> Intent	0,027	0,032	0,072	0,378	0,705
H5. Trust -> Intent	0,382	0,385	0,067	5,681	0,000*
H6. Trust -> Ease	0,627	0,620	0,044	14,393	0,000*
H7. Trust -> Useful	0,286	0,279	0,102	2,803	0,005*
H8. Trust -> Risk	0,491	0,491	0,043	11,492	0,000*

Table 12
Mediation effects.

Mediation	Original Sample	Sample Mean	Standard Deviation	*T* Statistics	*P* Values
H9. Trust -> Ease -> Intent	0,200	0,193	0,050	3,964	0,000*
H10. Trust -> Useful -> Intent	−0,010	−0,011	0,021	0,477	0,634
H11. Trust -> Risk -> Intent	0,013	0,016	0,035	0,378	0,706

Table 13
Moderation effects.

Moderation	Original Sample	Sample Mean	Standard Deviation	*T* Statistics	*P* Values
H12. Mod_rlg Trust -> Risk	0,135	0,132	0,058	2,337	0,020*
H13. Mod_rlg Risk -> Intent	−0,004	0,000	0,057	0,067	0,947
H14. Mod_ftr Trust -> Useful	−0,024	−0,088	0,779	0,031	0,975
H15. Mod_ftr Useful -> Intent	−0,025	−0,009	0,171	0,146	0,884

Table 14
MGA-Religious concern to avoid *riba*.

	P-value new (Religious vs Non-religious)
Ease -> Intent	0,889
Ease -> Useful	0,195
Risk -> Intent	0,585
Trust -> Ease	0,199
Trust -> Intent	0,681
Trust -> Risk	0,049*
Trust -> Useful	0,278
Useful -> Intent	0,800

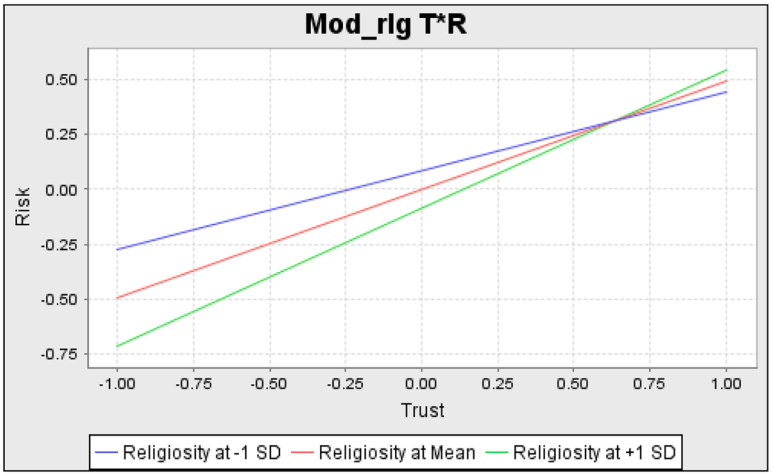

Fig. 2. Moderation effect of religious concern to avoid *riba* on the trust and low-risk perception relationship.

Table 15
MGA-Islamic features.

	P-value new (Features vs Non-Features)
Ease -> Intent	0,248
Ease -> Useful	0,069
Risk -> Intent	0,801
Trust -> Ease	0,063
Trust -> Intent	0,708
Trust -> Risk	0,459
Trust -> Useful	0,098
Useful -> Intent	0,267

5. Discussions

The first objective of this study is to analyze the integration of TAM with trust and to examine trust's effect on other factors. Limited studies suggest that trust serves as an independent variable influencing perceived ease of use, usefulness, and risk. Most studies indicate that trust operates in a reverse manner or functions as an intervening variable [5,7,26,34,55,65,103,107,174], while some studies propose that trust acts as a moderating variable [30,86,100,155], or as an independent variable alongside perceived ease of use [93,174,192], perceived usefulness [124,192], or perceived risk [62,93], directly or indirectly influencing usage intention or adoption.

This study reveals that trust has a positive effect on all factors examined. Trust positively affects perceived ease of use, which reflects customers' perception of the technology's user-friendliness [123]. This user-friendliness is characterized by the technology's ability to be utilized anytime and anywhere with minimal effort [82]. When trust is high, customers tend to see the technology as easy to use. Conversely, low levels of trust reduce the perceived ease of use [123]. Studies on how trust influences perceived ease of use suggest that users who trust a technology are more likely to perceive it as a simpler experience. As using it demands minimal mental effort, trust alleviates potential conflicts or anxiety, thereby enhancing users' perceived ease of use [20,123,127,149,156,179]. When customers have trust in BSI, they feel more at ease and confident when using BSI Mobile, which simplifies their experience. This study suggests that trust in BSI mitigates customers' anxiety, improving their perception of BSI Mobile as a user-friendly application, even in the aftermath of service failures following a cyberattack. This trust enables them to concentrate on their tasks more effortlessly, thereby improving the perceived ease of use.

Trust positively affects perceived usefulness, which reflects customers' confidence in the service provider's ability to fulfill its promises. When customers trust a service provider, they perceive its offerings as rewarding, efficient, and productive. A high level of trust enhances the perception of technology as useful, whereas low trust undermines this perception [123,189]. Studies on how trust influences perceived usefulness indicate that when customers trust a service provider, they are more likely to consider its services to be beneficial [20,72,93,123,127,149,156,174,179,189]. This study suggests that trust in BSI can positively impact customers' perceptions of BSI Mobile as a valuable application. Despite the service failures following the cyberattack, this trust fosters confidence that BSI can assist them in achieving their goals. Consequently, customers trust that BSI Mobile is capable of delivering reliable service, thereby increasing its perceived usefulness.

This study found that trust has a positive effect on low-risk perception. Customer trust reflects their belief that the potential risk for monetary loss or data leakages is relatively low. As a result, they consider the benefits of using the service as greater than the risks [123]. Studies on how trust influences perceived risk suggested that trust plays a significant role in shaping perceived risk. High levels of trust tend to mitigate perceived risk, while low levels of trust can elevate it [100,123,125,156,163,189]. Trust helps to alleviate perceived risk or lower awareness of it, enabling customers to navigate anxiety and uncertainty along with their potential consequences more effectively [65]. This study suggests that trust in BSI acts as a mitigating factor, reducing customers' perceived risk, even in the aftermath of service failures following a cyberattack. When customers trust BSI, they are less likely to worry about potential adverse outcomes from using BSI Mobile, such as financial losses or data leaks. Trust reflects customers' belief in BSI's commitment to protect their interests and overcome misleading information, which in turn fosters a perception of low risk.

Multiple studies confirmed that trust influences customers' intention to use a technology [35,55,65,120,123,125,149,161,163,174,192]. In digital media platforms (OTT), trust is also a predictor of continuance intention to use [35]. Customers' intention to adopt mobile payment apps is substantially supported by initial trust [34]. Trust reflects customers' belief in the value of a product or service based on their cognitive knowledge and experience [7]. This study suggests that trust in BSI has a positive impact on customers' intention to continue using BSI Mobile, reflecting their confidence that BSI will fulfill its obligations. Customers feel assured that BSI will not take advantage of their vulnerabilities, which enhances their willingness to continue using BSI Mobile despite service failures following a cyberattack.

Previous studies consistently indicate that cyberattacks and service failures erode user trust across digital platforms, including banking, government, and cloud services. As trust diminishes, users develop negative perceptions related to ease of use and usefulness, leading to heightened caution concerning system reliability and data security [16,58,63,81,92,95]. When users become aware of security breaches, their

trust in the platform's ability to protect their information decreases, leading to a perception that the service is less user-friendly and less beneficial [16,63,95,101].

Cyberattacks and service failures heighten perceived risks, causing users to question the safety and reliability of digital services. This amplified how perceived risk negatively affects trust and attitude towards using the service [16,63,78,92,140]. Previous studies have primarily shown that cyberattacks and service failures tend to lower users' perceived ease of use and usefulness, increase perceived risk, and foster low trust, ultimately leading in a significant decline in users' intention to use the service [16,58,63,78,92]. This study confirmed that trust has a positive effect on all examined factors, implying that customers maintain a strong level of trust in BSI and its mobile banking services. This fosters their perception of BSI Mobile as a user-friendly, useful, and low-risk application, thereby encouraging continued use despite service failures following the cyberattack. These findings are against the existing literature on digital trust and technology adoption in the context of cyberattacks and failures in digital services.

The second objective of this study is to analyze what factors influence customers' continued intention to use BSI Mobile. Previous studies have indicated a consistent pattern in cases of cyberattacks and service failures, revealing that decreased trust and increased perceived risk, both directly and indirectly, reduce users' intention to continue using digital services [16,26,62,78,92,140]. Additionally, a decrease in perceived ease of use and usefulness associated with cyberattacks and service failures ultimately leads to a decrease in users' willingness to continue using these services [16,63].

Unlike previous studies on cyberattacks and service failures, which typically found that a decrease in perceived usefulness led to a decrease in intention to use, this study revealed different findings: perceived usefulness did not affect customers' intention to continue using BSI Mobile after experiencing service failures following a cyberattack. Some studies with similar findings indicate that perceived usefulness does not affect users' intention to use digital banks, as it is overshadowed by other factors such as attitude and convenience [59], or users' intention to use social networking services, as it is overshadowed by perceived enjoyment [79]. Thus, when perceived usefulness (t-statistic: 0.498, p-value: 0.619) does not affect intention to continue using BSI Mobile after experiencing service failures following cyberattacks, it may be overshadowed by trust (t-statistic: 5.681, p-value: 0.000) and perceived ease of use (t-statistic: 4.313, p-value: 0.000).

Based on respondent characteristics (Table 3), although they use BSI Mobile for some purposes like balance checking (69 %) and transfers (16 %), mostly twice to five times a month, BSI Mobile may not be their first choice. 95 % of them retain conventional bank accounts, and 92 % of them have e-wallets. The e-wallet is the most widely used application (83 %) due to its lower fees (17 %), sales promotions (18 %), and integrations with other services (60 %), such as online transportation (59 %) and online shopping (31 %). Most of them use Gopay (36 %), Shopeepay (25 %), and OVO (23 %). According to the 2023 e-wallet industry outlook by InsightAsia, e-wallets are the preferred payment method among digital communities, surpassing cash and bank transfers. Gopay has become the most widely used e-wallet over the past five years, with 58 % of users continuing to use it faithfully. After the merger of Gojek and Tokopedia (known as GOTO), as the biggest online transportation service and e-marketplace, Gopay will continue to lead the market [39]. Thus, customers may feel that BSI Mobile is less useful than e-wallets (83 %) or conventional bank apps (12 %).

Moreover, unlike previous studies on cyberattacks and service failures, which typically found that an increase in perceived risk leads to a decrease in intention to use, this study revealed different findings: perceived risk did not affect customers' intention to continue using BSI Mobile after experiencing service failures following a cyberattack. A previous study with similar findings to this study [185] suggests that the insignificant effect of perceived risk on intention to use may stem from users not fully engaging with cognitive processes that involve conscious thought, gathering information, or assessing potential risks, particularly among those who are accustomed to using the service and have made it a habitual practice. Moreover, when customers face a lack of alternatives or perceive a service as necessary, they may prioritize convenience over risk concerns in their decision-making. Like during the COVID-19 pandemic, where customers continued to use restaurant and food delivery services despite heightened risk perceptions, driven by necessity and limited options [50,70]. Thus, this study confirmed that after experiencing service failures following cyberattacks, customers may disregard risk factors due to their habitual usage (72 % use BSI Mobile 2–5 times a month) or due to perceived necessity (88 % chose BSI for religious reasons to avoid *riba*).

This study also presents contradictory findings regarding trust and perceived ease of use in the context of cyberattacks and service failures, which typically indicate that a decrease in trust and perceived ease of use leads to a decrease in intention to use. This study revealed that both factors have a positive influence on customers' intention to continue using BSI Mobile. Trust in BSI helped customers feel less overwhelmed and reduce concerns about security risk, which encouraged them to continue using BSI Mobile. Limited studies in this context indicate that users are still intent to continue using digital services, which are positively influenced by trust [26,71,102,115], or perceived ease of use [16,105,160]. Customers' perceived ease of use enhances BSI Mobile's capacity to provide straightforward services, encouraging customers to continue using it. Thus, trust and perceived ease of use alleviate customers' concerns about service failures following a cyberattack, instilling a sense of security and comfort in customers as they continue to use BSI Mobile.

The third objective is to analyze the role of mediators. This study suggests that only perceived ease of use serves as a mediator in the indirect relationship between trust and intention to use, while perceived usefulness and low-risk perception do not play a mediating role. Perceived ease of use serves as a mediator, acting as a conduit that transmits the indirect effects of trust to the intention to use. Limited studies demonstrated that trust is mediated by perceived ease of use, such as a study by Li et al. [96] where perceived ease of use mediates trust, which indirectly elevates patients' intentions to use video telemedicine follow-up services, or AI-powered service robots at hospitals [98]. In limited cases, perceived ease of use also mediates trust, which indirectly elevates customers' acceptance of robot service as the key drivers of customers' intention to revisit a restaurant [156], or shoppers' intention to continue using online shopping [103]. Thus, despite service failures following a cyberattack, a higher level of customers' trust in BSI can overshadow all technical problems, making it seem effortlessly accessible, which in turn promotes customers' intention to continue using BSI Mobile. This finding highlights the importance of BSI's ability to provide rapid recovery, preventing prolonged service failures or cyberattacks that could compromise customer trust and impact BSI's digital services.

The fourth objective is to analyze the role of moderators within the proposed model. Limited studies examined how religiosity as a moderator may mitigate the perceived risk's negative effect on trust [171], or mitigate perceived risk's negative effect on satisfaction [138], or how religiosity as a moderator may strengthen perceived value effects on trust [4,5], or the satisfaction effect on trust [4]. Most studies examined how trust as a moderator may mitigate perceived risk's negative effect on behavioral intention [86], or how perceived risk as a moderator may weaken trust's effect on decision-making [62]. Instead of examining the religiosity moderating role on the relationship between perceived risk and trust [171], this study takes a different approach by examining the relationship between trust and low-risk perception, as well as the relationship between low-risk perception and the intention to use. Then, it investigates how religiosity, as a moderator, may either strengthen or weaken these relationships, and whether the impact is higher for the group of customers with religious concerns in avoiding *riba*.

To analyze the role of religiosity as a moderator, the MGA revealed

that customers' religious concern to avoid *riba* positively moderates the relationship between trust and low-risk perception, and the impact is higher for customers with religious concerns to avoid *riba* than for those without such concerns. This finding suggests that the motivation to avoid *riba* strengthens the relationship between trust and a perception of low risk. However, for the relationship between low-risk perception and intention to use, motivation to avoid *riba* does not serve as a moderating role, indicating it failed to strengthen that relationship. As a faith-based commitment, the motivation to avoid *riba* partially influences customers' continued usage behavior following service breakdowns due to cyberattacks, particularly through its moderating role in the relationship between trust and low-risk perception.

The absence of a religious moderation effect related to low-risk perception and intention to use is consistent with other findings, which indicate that low-risk perception has no direct effect on intention to use and no mediating effect on the relationship between trust and intention to use. Yadav & Shanmugam [190] confirmed that perceived risk was not a significant predictor of intention to use digital lending among mobile banking users, especially when other factors, such as perceived ease of use, perceived usefulness, and perceived security, were included in the model and overshadowed the perceived risk effect. Moreover, Wang et al. [185] found that the relationship between perceived risk and drivers' intention to use fully automated driving (FAD) in China was not significant because respondents' risk concerns might not align with available cognitive processes, resulting in a missed link between perceived risk and behavioral intention. Cognitive processes involve conscious thought, gathering information, and assessing probabilities to understand the risk. Users already accustomed to using an application may not be as concerned about the risk. In this case, the behavior becomes habitual, and intention to use is not influenced by perceived risk.

The findings in this study indicate that the absence of direct and indirect effects of low-risk perception is overshadowed by trust. Customers with higher trust in BSI and accustomed to using BSI Mobile are no longer concerned about the risks, even after cyberattack-induced service breakdowns. In contrast, given that 83 % of respondents prefer to use e-wallets over other apps and 95 % of them retain conventional bank accounts, this implies that customers' preference for e-wallets and their retention of conventional bank accounts might override the low-risk perception effect. Customers who prefer to use e-wallets or conventional banks over Islamic banks' apps due to factors like convenience, established reputation, wider accessibility, lower perceived costs, and sometimes a belief that the religious constraints of Islamic banking are not strictly enforced or are negotiable, even though some prefer *Sharia*-compliant alternatives for religious reasons [31]. Thus, BSI Mobile is not the only reliable application available. Customers have alternative options when they encounter issues with BSI Mobile. Despite the risks of cyberattacks and prolonged service breakdowns, customers' trust in BSI remains high.

In line with the perception of low risk, users' perception of security is crucial when performing any digital transaction, which is measured by the extent to which they feel secure doing so. Kaur et al. [84] found that perceived security did not affect the intention to use central bank digital currency (CBDC) among households in India. The link between perceived security and intention is established if mediated only by perceived trust. Singu & Chakraborty [161] found that perceived security did not significantly impact intention to use mobile payment services (MPS) via mobile banking in India. Security against any perceived risks did not lead to user adoption of MPS. As MPS is dependent on wireless networks, which involve greater uncertainty and risk, providers must develop trust-building mechanisms [161]. Security should be an immediate cause of concern when carrying out digital transactions [84, 161]. Providers should be cautious when designing encrypted services that are equipped with multiple layers of security checks, along with simultaneous and adequate fraud detection measures to mitigate the related privacy concerns [161]. Thus, although low-risk perception has no impact on BSI Mobile's continued usage after cyberattacks and service breakdowns, improving trust is of utmost importance as its usage involves uncertainty and risks.

To analyze the role of Islamic mobile banking features as a moderator, the MGA revealed that the Islamic features in BSI Mobile did not moderate the relationship between trust and perceived usefulness or between perceived usefulness and intention to use. The Islamic features failed to elevate BSI Mobile's utilities after experiencing service breakdowns following a cyberattack. This is consistent with other findings where perceived usefulness did not directly affect intention to use, nor did the mediation effect for the trust and intention to use relationship. These findings are in line with previous studies, whereas perceived usefulness did not influence customers' interest in using online shopping [134], Bank DKI Jakarta's mobile app [192], e-learning among students [47], a *Sharia*-based e-wallet [9], or an online cash waqf crowdfunding [88].

When comparing user experience, perceived usefulness, or preferences of Islamic apps with Islamic mobile banking, such as BSI Mobile, Islamic apps like Muslim Pro might be favored over BSI Mobile due to their more specialized and comprehensive Islamic features for Muslim religious routines. A study by Shameera et al. [158] indicated that perceived usefulness and ease of use are key factors driving the adoption of the Muslim Pro app among Muslim youth. Muslim Pro is widely recognized for its focus on meeting the needs of Islamic worship, including accurate prayer times, *Qibla* direction, and additional religious content. Users perceive it as useful for supporting daily religious practices and improving adherence to Islamic principles.

Although BSI Mobile is quite popular among *Sharia*-compliant banking apps, it is not primarily designed for religious functions. User satisfaction with BSI Mobile is more closely linked to product quality, ease of use, and banking features rather than religious utility. Complaints often center on login and registration processes, and while the app is popular, its primary appeal is for financial transactions, not worship support [75,143]. Thus, the absence of the Islamic features moderating effect related to the relationship between trust and perceived usefulness, as well as the relationship between perceived usefulness and intention to use, suggests that after service breakdowns following cyberattacks, Islamic features may not effectively distinguish Islamic mobile banking from conventional ones. Those who are involved in spiritual routines may prefer to use other Islamic apps, such as Muslim Pro, rather than BSI Mobile.

6. Theoretical contribution

This study makes several theoretical contributions to the existing literature. First, as a real event in the digital transformation of Islamic banking in Indonesia, it adds to the Islamic banking literature by examining Muslim customers' adoption of Islamic mobile banking, employing the Technology Acceptance Model (TAM) as its theoretical basis, focusing on the key constructs of perceived ease of use and perceived usefulness. Second, this study contributes to the existing TAM literature by integrating trust as an independent variable and low-risk perception as a mediator. Most existing studies view trust as either a mediator or a moderator of the relationship between variables. In this trust, it positively mediates or strengthens the relationships between perceived ease of use and intention to use, as well as between perceived usefulness and intention to use. It also negatively mediates, or lessens, the relationship between perceived risk and intention to use. In response to the cyberattacks targeting BSI, Indonesia's largest Islamic bank, this study adopts a different approach. In the proposed model, low-risk perception, perceived ease of use, and perceived usefulness serve as mediators, positioning trust in a reverse role.

Third, this study contributes to the limited existing literature on cyberattacks and service failures by proposing and analyzing Muslim customers' digital trust and their continued intention to use Islamic banks' digital services, with perceived ease of use, perceived usefulness,

and low-risk perception as mediators. Most existing studies have consistently shown a pattern: a decrease in trust following cyberattacks and digital service failures increases perceived risk, decreases perceived ease of use, and reduces perceived usefulness, prompting users to abandon the service. Thus, this study contributes to the limited existing literature by analyzing whether cyberattack-induced service breakdowns in BSI networks cause customers to distrust BSI and abandon BSI Mobile, proposing a TAM-trust mediation model.

Fourth, this study contributes to the existing limited literature in the context of cyberattacks and service failures in the adoption of Islamic banks' digital services by proposing and examining whether religiosity as moderators may either strengthen or weaken the relationships between trust and low-risk perception, as well as the low-risk perception and intention to use, and then investigates whether the impact is higher for the group of customers with religious factors. Thus, this study contributed to the limited existing literature in the context of cyberattacks and service failures by analysing whether customers religious concern to avoid *riba* as a faith-based commitment, motivate customers to continue using BSI Mobile despite service breakdowns post-cyberattacks, through its moderating role on the trust and low-risk perception relationship, as well as the low-risk perception and intention to use relationship, and then investigates whether the impact is higher for the group of customers with religious concerns in avoiding *riba*.

Fifth, this study contributes to the existing limited literature in the context of cyberattacks and service failures in the adoption of Islamic banks' digital services by proposing and examining whether Islamic features in Islamic banks' mobile banking as a moderator may strengthen the relationships between trust and perceived usefulness, as well as the perceived usefulness and intention to use. Then it investigates whether the impact is higher for the group of customers who utilize the Islamic features. The lack of TAM studies that integrate religious factors in the context of Islamic banks' digital service failures following cyberattacks, and propose the TAM-trust mediation-moderation model, has, to the author's knowledge, not been analyzed.

Ultimately, this study's theoretical contribution lies in integrating religiosity—specifically, the avoidance of *riba*—and Islamic mobile banking features as moderators within the established TAM-trust mediation model. The existing studies primarily focus on efficiency, risk management, and stability, rather than customer behavioral responses to cyberattacks and service failures [66,122,147]. In conventional banking studies, awareness of cyberattacks consistently reduces customer trust, leading to attrition. If robust cybersecurity and transparent communication are not in place, trust will erode, and switching intention will increase [26,80]. Customers of both Islamic and conventional banks prioritize trust, security, and service reliability over religious affiliation when functionality is compromised [26,142,173].

While Islamic banks may benefit from a faith-based commitment, recent studies do not provide clear evidence that religiosity alone protects them from customer attrition following cyberattacks, which can lead to service failures. The findings in this study highlight the moderating role of religiosity by establishing that customers' religious concerns about avoiding *riba* serve as a faith-based commitment factor, which uniquely strengthens the relationship between trust and low-risk perception. The presence of religious moderation enhances the role of trust in mitigating perceived risks following cyberattack-induced service failures. This moderation effect likely arises from the activation of forgiveness, which can soften evaluations of the service failure encounter.

However, religiosity did not moderate all relationships in the model. The Islamic mobile banking features have no moderating effect on any relationships. It did not moderate the trust and perceived usefulness relationship, nor the perceived usefulness and intention to use relationship. The insignificant moderating role of Islamic features in this study suggests that these features were unable to distinguish Islamic mobile banking services from conventional ones effectively.

This study found that trust is a major driver of Islamic mobile banking adoption following cyberattack-induced service failures, confirming that Islamic banks must develop trust-building mechanisms. The overall findings of the study will enrich the understanding of Islamic banks' digital services adoption among Muslim customers and provide a framework for researchers to use this model to validate Islamic banks' digital services adoption, particularly their response to cyberattacks and service failures in other Islamic banks in Indonesia or other countries.

7. Practical implications

The proposed model can help practitioners understand how trust is a major predictor of customer continuance intention to use Islamic banks' digital services in response to cyberattacks and service failures. Since trust is a key factor in BSI customers' intention to continue using BSI Mobile despite cyberattack-induced service breakdowns, BSI must focus on developing a stronger trust-building mechanism in its digital banking environment by implementing specific risk management strategies.

To establish a strong foundation for trust-building mechanisms, BSI must prioritize achieving ISO 27001 certification, which provides a globally recognized framework for an information security management system, enabling the systematic reduction of service failures and fostering trust with customers and partners. ISO 27001 requires organizations to identify, assess, and treat information security risks, ensuring that controls are in place to prevent common failures such as unauthorized access, data breaches, and operational disruptions [40,89,170].

BSI could also adopt the NIST Cybersecurity Framework for broader coverage. NIST provides a flexible, risk-based cybersecurity approach that aligns well with regulatory and industry requirements. While ISO 27001 offers a certifiable path for demonstrating compliance, NIST provides practical guidance for ongoing risk management and incident response. The NIST similarly provides a structured framework for identifying, protecting, detecting, responding to, and recovering from cyber threats, supporting transparency and continuous improvement in security posture. Both frameworks are often mapped to one another and can be implemented together to enhance maturity and coverage [144].

Certification signals BSI's commitment to managing information security risks and adhering to best practices, thereby building trust with customers and partners by meeting regulatory requirements and global standards. The utilization of digital services presents challenges for banks and perceived risk for customers in adapting to innovation. Offering detailed, comprehensive information, a money-back guarantee, and reassurance services fosters a stronger trust-building mechanism within the digital banking environment. Banks must commit considerable effort to designing a website interface equipped with enhanced security features [86]. This will bolster customer confidence and improve the usability and reliability of BSI's digital services.

To enhance public confidence in using digital banking services, the government and the banking industry must foster a digital business ecosystem that integrates technological and environmental support. Cybersecurity threats are still on the rise and are expected to continue increasing. OJK (Indonesia's Financial Services Authority), BI (Bank of Indonesia), Kominfo (The Ministry of Communications and Informatics), and BSSN (State Cyber and Code Agency) must urge the banking industry to secure its information technology systems immediately. When breakdowns occur, BSI needs to remind the public to be aware of potential fraud and cybercrime by verifying the accuracy of information circulating. If the BSI's director only announced that the system would gradually recover while the breakdowns still occurred, and much negative information on the Internet, it became national news for days [151], leaving customers confused, anxious, and frustrated, which ultimately breaks their trust. BSI must be transparent to the public and improve its handling of complaints.

Effective complaint management hinges on providing customers with multiple, easily accessible channels—such as social media, online

forms, and direct messaging—to report issues and receive support. Fast, prompt responses are crucial, as they significantly impact customer loyalty and brand credibility, particularly during service failures and cyberattacks. Social media has emerged as a vital platform for resolving complaints rapidly, thereby reducing negative word-of-mouth and customer retaliation when handled effectively. Automated systems, including AI-driven complaint categorization, can further expedite response times and ensure that complaints are directed to the right experts promptly.

Moreover, this study also indicated that, to enhance customers' perceived usefulness and intention to continue using BSI Mobile after service breakdowns caused by cyberattacks, customers place a significant emphasis on the perceived ease of use. Thus, BSI Mobile's user-friendly design must be improved by simplifying interfaces, providing clear guidance, and prioritizing minimal steps for transactions, which will reduce user effort and confusion, making it easier to navigate and understand. Improving perceived ease of use will boost perceived usefulness and encourage continued use. Personalizing services by tailoring features to user needs, continuous feature upgrades, and ensuring quick response times can improve perceived ease of use, enhancing customers' perceived usefulness and long-term interest [106]. BSI Mobile could offer value-enhancing features that are more beneficial than those in other applications. This study indicated that Islamic features in BSI Mobile do not distinguish its benefits from e-wallets or conventional ones. The data showed that 83 % of respondents prefer e-wallets, with Gopay (36 %), ShopeePay (25 %), and OVO (23 %) being the most popular options among them. They prefer to use it for integration with other services (60 %), primarily for online transportation (59 %) and online shopping (31 %).

Jakarta is ranked as the tenth most congested city in the world [130]. Since respondents live in Jakarta and its nearby cities, motorcycle rides help users avoid traffic jams and serve as a crucial first- and last-mile connection to public transportation, making online transportation like Gojek a convenient mobility option for users [8]. BSI can offer promotional benefits for online transportation by forming partnerships, giving it a competitive advantage over other payment methods. Similarly, for online shopping, BSI can offer promotional benefits through various e-commerce platforms and merchants, allowing it to stand out compared to alternative payment options. Focusing on simplicity in user interface, compatibility, efficient features, seamless payment integration, real-time transaction updates, and easy navigation — all designed for online transportation and shopping — improves perceived usefulness and encourages continued use among users seeking a hassle-free experience.

The influence of trust and perceived ease of use on customers' intention to continue using BSI Mobile has been confirmed in this study. The more confident customers are and the more they perceive ease of use, the more likely they are to continue using BSI Mobile, even after service failures caused by a cyberattack. This study also confirms the role of religious concern in avoiding *riba* as an important moderator in strengthening the relationship between trust and low-risk perception. Customers with high religiosity concerns tend to have a stronger connection between their trust and low-risk perception compared to those with lower religiosity concerns. The number of customers in the reference group who trust BSI Mobile for transactions influences their perception of the service as low-risk. Most respondents are Millennials (76,8 %). They spend time online for an average of 3 to 7 hours daily, accessing social media, especially Instagram and YouTube [7]. BSI can partner with religious influencers and opinion leaders, seeking their support in a broad social media campaign to enhance customer trust and improve perceived low risk, especially during service failures and cyberattacks. Customers who value a secure and easy experience can also benefit from BSI providing customized video content on social media, helping users feel more secure and familiar with BSI Mobile's features and benefits.

Therefore, to remain at the forefront of the market, BSI must consistently explore customers' needs to deliver strong performance, creating a secure, easy, and pleasant experience. This approach builds the highest level of customer trust and long-term interest, which cannot be achieved overnight. Overall, this study provides valuable insights for the Islamic banking literature in general and for digital trust in the context of digital service failures and cyberattacks, in particular. It helps Islamic banks develop new strategies to boost their digital service reach.

8. Limitations and future research recommendations

There are some limitations of this study that could be addressed in future research. As respondents reflected on an incident 1 to 7 months after the cyberattack, they relied on fragile memories of their emotional reactions, which introduced a geographic limitation and increased the risk of recall bias. To address this issue, future research should analyze social media complaints by triangulating the findings with real-time social media sentiment during the outage period to achieve a more comprehensive and balanced understanding of how the public perceives an incident.

Restricting respondents to Jakarta and its satellite cities overlooks Indonesia's broad socioeconomic diversity. Current research on rebuilding trust after cyberattack-induced service failures highlights general strategies and psychological mechanisms but does not explicitly address whether rural, older, or less tech-savvy populations show different trust-rebuilding behaviors after a crisis. To contribute not only to the immediate findings but also to the broader scholarly conversation in this field, a cross-cultural analysis comparing these results across various geographic and regulatory landscapes presents a compelling area for further investigation. Future research should expand its sampling beyond the urban centers of Jabodetabek. It should also focus on rural areas, diverse generations, and varying levels of tech-savviness, among other factors, to gain a better understanding of Indonesia's socioeconomic diversity.

Religiosity and trust may play a subtle role in moderating customer attrition. Previous studies indicate that Islamic bank customers do not respond fundamentally differently to cyberattacks compared to customers of conventional banks. Comparative research on risk management and stability between Islamic and conventional banks finds no significant differences in resilience to financial crises or risk management effectiveness [66,122], but there is minimal direct research comparing Islamic and conventional bank customer responses specifically to cyberattacks. To explore whether faith truly shields Islamic banks from attrition when their functionality declines, future research should compare these findings with those from non-Islamic banking cases (e.g., how conventional bank customers reacted to similar cyberattacks). This study has significant limitations. Additional mediators and moderators can be identified and their relationships examined. Employing qualitative or mixed-methods approaches could yield richer, more nuanced insights into user perceptions and behaviors following a cybersecurity breach.

CRediT authorship contribution statement

Muniaty Aisyah: Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology, Formal analysis, Data curation, Conceptualization. **Yunia Silvia Sesunan:** Writing – review & editing, Resources, Formal analysis, Data curation. **Ahmad Tibrizi Soni Wicaksono:** Writing – review & editing, Validation, Software, Methodology, Formal analysis, Data curation.

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.

Data availability

Data will be made available on request.

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