The effects of environmental factors on user's personal traits related to mobile payment adoption: a case study of Indonesia

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Abstract

Purpose – This study aims to investigate the influence of environmental factors on individual personality traits associated with mobile paymens (MP) adoption using the technological personal environment (TPE) theory as a framework for the proposed theoretical model.

Design/methodology/approach – A total of 736 feedback from respondents was used to validate the proposed model using structural equation modeling. The model comprises Trust and Self-efficacy to explain MP adoption from a personal trait perspective. Meanwhile, environmental aspects are represented by social influence, vendor regulations and network externalities.

Findings – The result indicates that self-efficacy has the most significant direct effect on user intention to use MP, followed in decreasing order of significance by social influence, trust, vendor regulations and network externalities. Furthermore, social influence is the most contributing aspect from the environmental area that influences user intention directly and indirectly through trust and self-efficacy as mediators. Meanwhile, the moderating effect analysis also found that gender moderates the effect of user self-efficacy on MP adoption.

Originality/value – This study fills the gap by comparing trust and self-efficacy and exploring how those factors are developed and affected by the environmental aspect of MP usage. It was discovered that self-efficacy was the most influential construct influencing the adoption of MP. Social influence was identified as the primary environmental factor that directly impacts user intention regarding MP usage. Furthermore, gender was shown as a moderator, as males place a higher value on self-efficacy as a factor affecting their intention to embrace MP in comparison to females.

Keywords Mobile payment, Personal trait, Adoption, Technological personal environment, SEM

Paper type Research paper

1. Introduction

In today's society, many merchants and consumers have already adopted cashless payments, such as mobile payments (MP), to execute their financial transactions online and offline. MP refers to a payment service app installed in a mobile communication device that uses wireless technology to manage users' financial transactions in specific merchants (Handarkho and Harjoseputro, 2019). According to a survey by Deal Street Asia (2022), the

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total value of transactions using MP in Indonesia has already skyrocketed 43 times compared to five years ago, even during a pandemic. As mentioned by Mordor-Intelligence (2024), the MP market in Indonesia is expected to grow 29.5% from 2022 to 2027, with businesses nationwide adopting payment systems. The rise in internet usage and online shopping has fueled this growth. The market has extensive access to financial technology, and the industry uses reward systems and innovative incentives to retain and attract users. Indonesia is ranked the world's most mobile-oriented area, with users spending 5.5 h daily on mobile apps. Despite security concerns and data breaches, the maturity of mobile payment usage is exemplified by the increased adoption during the COVID-19 epidemic, especially in sectors like the Indonesian small- and medium-sized enterprise segment, indicating a shift toward modern alternatives to traditional debit and credit cards. It indicates that people are already accustomed to using MP because it provides an easy and convenient payment service that covers various payment transactions (Karsen *et al.*, 2019). In addition, this also shows how this platform will be able to manage its sustainability as a trustworthy payment platform in the future.

From the scholar's perspective, the initial study of the MP adoption is more focused on how technology can satisfy customer needs. Therefore, several acceptance models, such as technology acceptance model, unified theory of acceptance and use of technology (UTUAT) and UTAUT2, were adopted by prior related studies (Ma *et al.*, 2018; Johnson *et al.*, 2018; Migliore *et al.*, 2022; Wu and Liu, 2023). Nevertheless, because people are already familiar with the platform, the focus of the research has shifted from the technical aspects to the attitudes and responses of users about the platform's use. Previous research has investigated different factors that users consider while deciding whether or not to use MP, including user personal traits and environment. It indicates that studying users' personal characteristics toward technology adoption has gradually become an important topic that needs to be explored profoundly. This is also consistent with Handarkho's (2022) claim that individual personal attributes contribute to system adoption.

Unfortunately, the investigation of personal factors in MP adoption is more dominated by individual trust; neglecting other considered constructs can provide a deep insight into the system usage. Further research related to trust in the MP context put the factor either as the Predictor of Intention (Talwar *et al.*, 2020) or more significant as the dependent variable (Handarkho, 2021; Lisana and Handarkho, 2022). In addition, a literature review from Karsen *et al.* (2019) revealed that trust is the most explored factor in MP's study under ease of use and perceived usefulness. Therefore, analyzing other users' personality traits related to MP adoption becomes a gap that needs to be addressed to enrich and broaden the understanding of MP usage.

Another critical construct that requires more attention is user confidence in initiating and maintaining the use of technology to achieve their goals. According to Winarno *et al.* (2021), when users believe in their ability to use technology, it will affect their perception of the usefulness and convenience of a system to help them accomplish their financial transactions, leading to the continued system's adoption. Thus, this study proposed self-efficacy as a construct that needs to be investigated profoundly together with trust related to MP adoption. Specifically, this research defines self-efficacy as the ability of the individual to maximize the benefits that might be gained from a particular system due to the level of confidence in their capability to use the technology (Handarkho, 2020; Mouakket, 2020). Several prior studies have used this personal trait construct to predict intention (Upadhyay *et al.*, 2022; Winarno *et al.*, 2021; Lisana, 2021; Mouakket, 2020). However, they rarely investigated the formation of personal traits, especially self-efficacy, making this study offer an approach toward MP adoption that has yet to be explored deeply by prior studies.

This study, however, uses the technological personal environment (TPE) framework to explain the construct that affects user personal traits related to MP adoption. Specifically, TPE is a theory derivative from the technological organizational environment that has already been adapted to be more applicable to individuals than the organizational context (Karsen *et al.*, 2019). This framework has been used by the prior study related to MP adoption with various contexts and objectives (Hunafa *et al.*, 2017; Khan and Ali, 2018), making this theory already proven to be a basis for developing a model of MP adoption. Several prior studies have examined MP's personal and environmental aspects. Wu and Liu (2023) highlighted the role of individual differences and cultural factors in MP adoption by analyzing the UTAUT2 model using respondents from three regions: Chinese, American and Belgian users. Meanwhile, Fu *et al.* (2022) specifically used the technology–organization–environment to predict factors that affect the dissemination of MP usage in the micro retailer context. The environmental aspects, such as the scale of organizational and government support, were explored in the study above to explain how those constructs affect users' intention to adopt the platform. David-west *et al.* (2018) also investigated the business environment and regulation as the factors that might affect the adoption of MP in an emerging market. The result indicated that those constructs significantly impact MP adoption in society. In contrast to the studies mentioned above, this research focuses on exploring the interplay between environmental aspects and user personal traits that affect the adoption of MP. Regarding the TPE theory, this study posits that environmental construct influences technology adoption through personal traits. Therefore, this study proposes a theoretical model based on TPE frameworks to explain environmental aspects that affect the formation of individual trust and self-efficacy related to MP usage. Precisely, the environmental factors proposed in this study involve constructs associated with the social aspect and other constructs around the MP that affect and support the usage of the system (Karsen *et al.*, 2019). This approach has yet to be discussed profoundly by prior studies, ignoring how environmental factors affect user confidence in using the platform.

Overall, this study offers an alternative discussion related to the predictor of user personal traits in adopting MP, which prior studies have yet to discuss widely. To enrich the findings, this study includes the analysis of direct, indirect and moderating effects, which is considered another contribution for both theoretical and managerial aspects. Taken together, this research posits an alternative empirical model for predicting user intention to adopt mobile payments (MP), which is underpinned by environmental and personal dispositions. The proposed framework builds upon the TPE theory. Profoundly, the primary objective of this research is to contribute to a strategy that promotes user confidence to initiate and maintain the use of MP to carry out their goal. Finally, two research questions are proposed as follows:

RQ1. Which environmental factor affects trust and self-efficacy related to user intention to use MP?

RQ2. Which factors moderate the direct influence of trust and self-efficacy on user intention to use MP?

2. Literature study and hypotheses development

Table 1 summarizes the prior studies in the MP context that include personal traits as a part of their research focus. Most of the existing MP studies put a personal trait as a secondary factor in their proposed model as a predictor to explain user perception toward the usefulness and convenience of the system (Handarkho and Harjoseputro, 2019;

The focus of the study	Basic theory	Personal trait variable	Other variable	Reference
Factors influencing users in adopting mobile payment in physical stores	Push–pull–mooring theory	Consumer innovativeness	Subjective norms, perceived herd, risk, enjoyment, convenience, deal proneness and intention	Handarkho and Harjoseputro (2019)
Consumers' intention to use MP		Trust	Perceived risk, perceived benefit and intention	Park *et al.* (2019)
Predictor of trust on MP usage leading to continuance intention	Innovation diffusion theory	Trust	Perceived risk, mobility, customization, security and reputation	Shao *et al.* (2019)
Exploring user intention to adopt MP	UTAUT	Trust, anxiety and innovativeness	Performance expectancy, effort, social influence, facilitating condition and grievance	Patil *et al.* (2020)
Predictor of initial trust leading to continued intention to use MP	Information systems success model and transaction cost	Trust	Usefulness, confirmation, dissatisfaction, information quality, service quality, uncertainty and perceived asset specificity	Talwar *et al.* (2020)
Factors affecting user acceptance on P2P mobile payment usage	TAM	Trust and innovativeness	Risk, subjective norms, usefulness and ease of use	Kalinic *et al.* (2020)
Understanding mobile payment continuance usage in physical settings	Social impact theory and trust transfer	Trust	Perceived herd, risk, parasocial interaction and continuance usage	Handarkho (2021)
Determining factors that influence an individual's intention to use mobile payment	UTAUT and TAM	Trust and self-efficacy	Uncertainty avoidance, network externalities, social influence, ease of use, usefulness and intention	Lisana (2021)
Explaining MP continuance usage in a physical store using a habit perspective	Habit theory	Habit	Satisfaction, usefulness, deal proneness, social tie and compatibility	Handarkho *et al.* (2021)
The determinants of behavioral intention to use the MP application	TAM	Self-efficacy	Enjoyment, subjective norms, usefulness and ease of use	Winarno *et al.* (2021)
Exploring the continued use of mobile payment contactless technologies	Protection motivation theory (PMT) and the expectation-confirmation model (ECM)	Trust, self-efficacy and response efficacy	Satisfaction, usefulness, perceived severity, perceived vulnerability and response cost	Al-Sharafi *et al.* (2022)

Table 1. Overview of prior studies

(*continued*)

The focus of the study	Basic theory	Personal trait variable	Other variable	Reference
The determinant of user trust toward MP usage	Social impact theory and uncertainty avoidance theory	Trust	Usefulness, uncertainty avoidance, security, subjective norms and network externalities	Lisana and Handarkho (2022)
Factors that affect consumers' intention to use MP during COVID-19	Meta-UTAUT	Self-efficacy	Performance expectancy, effort expectancy, social influence, facilitating condition, attitude and intention	Upadhyay *et al.* (2022)
Investigate MP adoption in different cultural countries	UTAUT2	Hedonic motivation, habit and personal innovativeness	Risk, performance expectancy, effort expectancy, facilitating condition and price value	Wu and Liu (2023)

Source: Table created by authors

Table 1.

Park *et al.*, 2019; Patil *et al.*, 2020; Kalinic *et al.*, 2020; Lisana, 2021; Wu and Liu, 2023). Other researchers, on the other hand, have suggested a different focus by putting personal traits as the primary construct, especially after the MP adoption became usual for society, such as studies about the development of trust toward the platform (Shao *et al.*, 2019; Talwar *et al.*, 2020; Handarkho *et al.*, 2021; Lisana and Handarkho, 2022). As shown in Table 1, trust and self-efficacy are two factors of the personal trait aspect examined extensively in previous studies. However, in the MP adoption context, only trust that was explored profoundly neglected the observation of self-efficacy. This research, therefore, presents a new perspective on mobile payment (MP) adoption by examining users' personal traits in addition to trust. Previous studies focused heavily on trust as the main factor, neglecting other crucial factors. This study introduces self-efficacy as a critical factor and proposes the TPE framework to explore the interplay between environmental aspects and user personal traits that influence MP adoption. Unlike previous studies examining environmental factors in isolation, this research proposes a comprehensive model that considers social aspects and constructs around MP. The study analyzes direct, indirect and moderating effects to contribute to theoretical understanding and offer managerial insights. In essence, this research provides a holistic perspective on predicting user intention to adopt mobile payments, enriching the existing literature and offering a valuable framework for promoting user confidence in using MP for financial transactions. Therefore, this study fills the gap by comparing trust and self-efficacy and exploring how those two factors are developed and affected by the environmental aspect of MP usage.

2.1 Environmental aspect in IT adoption

Several studies have indicated that environmental factors are decisive in technology acceptance. Anthony *et al.* (2020) assert that at the organizational level, environmental factors such as administrative policies and institutional pressure significantly influence the decisions taken by organizations regarding information technology (IT) implementation. In detail, administrative policies can influence organizational behavior to conform with established objectives (Simmonds and Bhattacherjee, 2014), extending to IT adoption.

Furthermore, David-West *et al.* (2018) also investigated the impact of policy and regulation cogency on MP adoption in emerging markets, reinforcing the role of environmental factors in technology adoption. Additionally, Zhong and Nieminen (2015) argued that relying solely on internal organizational factors is insufficient for successfully adopting a technology strategy. Businesses should also consider the environmental aspect as an opportunity and motivation to adopt specific technologies to improve their competitive advantage. Another external factor that is believed to affect technology adoption is derived from social and cultural aspects. Wu and Liu (2023) studied how country differences influence technology adoption. Their research focused on analyzing the UTAUT2 model and the role of individual and cultural factors in mobile payment adoption. The study included participants from three regions: China, the USA and Belgium. The findings demonstrated that individual cultural backgrounds influence the impact of social influence on user intention. This highlights the significant role of environmental factors in technology adoption, such as individual cultural background. Handarkho and Harjoseputro (2019) also highlighted the impact of social norms on adopting technology. It means the behavior of individuals in adhering to social norms can either facilitate or inhibit their willingness to adopt a particular technology. Consequently, this may lead people to undervalue their own knowledge and follow the decisions of others regarding the adoption of technology.

While several studies above examine how environmental factors affect businesses, this study takes a different approach. It focuses on the user perspective by applying the TPE theory as a foundational framework to propose a theoretical model. This shift in perspective allows for a deeper understanding of the relationship between the environmental aspect and the individual personal trait related to technology adoption, especially in the MP context. Thus, this study will posit environmental aspects that cover social values, regulations and policies, which are believed to affect individual personal traits associated with technology adoption. In detail, the aspect will cover all the circumstances around the system that influence and support the operation of specific technologies (Khan and Ali, 2018).

2.2 Technological personal environment framework

According to the TPE theory, user acceptance of technology is affected not only by external factors but also by internal factors derived from the user's personal traits associated with the technology adoption (Hunafa *et al.*, 2017; Karsen *et al.*, 2019). Therefore, this study proposed two constructs from personal characteristics contributing to MP adoption related to how users deal with the vulnerability attached to MP as a digital payment service. Those two constructs are trust and self-efficacy, which explain user confidence toward the ability of MP and themselves, respectively, to manage financial transactions using the system (Lisana and Handarkho, 2022; Winarno *et al.*, 2021). Meanwhile, this study uses three constructs: social influence, vendor regulations, and network externalities to explain how environmental aspects affect user personal traits, leading to MP acceptance. Both social influence and network externalities constructs are derived from the social circumstances of MP usage that contribute to MP adoption (Shankar and Datta, 2018; Bailey *et al.*, 2017). At the same time, vendor regulations are chosen to demonstrate how formal rules and regulations provided by vendors affect user confidence in using the system (Lisana and Handarkho, 2022).

2.3 User personal trait in mobile payments adoption

The involvement of user personal traits as a driver of technology adoption has become a research topic by many scholars (Humbani and Wiese, 2019; Handarkho and Harjoseputro, 2019; Kim *et al.*, 2020; Handarkho, 2022). In the MP context, trust is considered a critical construct from individual personal traits contributing to user system adoption

(Sleiman *et al.*, 2021). As defined by Lisana and Handarkho (2022), trust refers to the user's acceptance of the risk and susceptibility attached to MP, which invariably becomes a concern, especially in digital payment services. By developing trust, people will minimize the risk of affecting their insecurity and reluctant feelings in using MP to handle their financial transactions (Humbani and Wiese, 2019). Many prior studies have confirmed the role of trust as a primary driver of MP adoption (Karsen *et al.*, 2019; Liu *et al.*, 2019; Caldeira *et al.*, 2021; Zhao and Bacao, 2021), making this study proposed the following hypothesis:

H1. Trust has a positive direct effect on users' intention to use MP.

While trust tries to expose user confidence in the ability of MP to address their financial transaction needs, self-efficacy reflects the degree to which the user believes he is capable of completing their financial transaction while using the system (Winarno *et al.*, 2021). Specifically, this construct explains user assessment of their confidence and ability to complete their financial transaction using a particular MP system, which is believed to affect the success of technology adoption (Mouakket, 2020). Related to uncertainty attached to MP, this construct is also associated with user confidence in their appraisal ability toward the potential risk due to the system usage (Upadhyay *et al.*, 2022). This construct also helps minimize user perception toward threats and risks attached to the system, making it suitable to accompany trust to explain user intention toward MP. Many prior studies of MP also already confirm the positive influence of this construct on MP adoption (Lisana, 2021; Winarno *et al.*, 2021; Al-Sharafi *et al.*, 2022; Upadhyay *et al.*, 2022), making this study proposes the following hypothesis:

H2. Self-efficacy has a positive direct effect on the user's intention to use MP.

2.4 Environmental aspect in mobile payments adoption

Previous studies have shown that personal traits related to technology adoption are shaped by environmental factors. This indicates that the environment can influence the adoption of technology through personal traits, based on the TPE theory. To conceptualize the environmental context, this study uses the stable context theory proposed by Aldrich *et al.* (2011), which suggests that the intention to adopt a particular behavior is influenced by environmental factors that consistently influence the individual (Handarkho *et al.*, 2021). Regarding technology adoption, these environmental factors can include the physical and social environment surrounding the behavior, as well as the platform's readiness to support the adoption (Mazar and Wood, 2018). Therefore, this study examines the external factor related to the system that aligns with the activity of MP (Khan and Ali, 2018).

In the context of technology adoption, the use of specific technology is believed to be influenced by society's perspective, which can further affect one's behavior (Handarkho *et al.*, 2021). This aspect is called social influence. With regard to MP context, social influence is defined as the extent to which users believe opinions from people considered important to them, influencing their intention to adopt MP (Upadhyay *et al.*, 2022; Lisana, 2021; Venkatesh *et al.*, 2012). Winarno *et al.* (2021) believed that social influence around the MP environment will benefit the development of MP adoptions. Specifically, users tend to be confident with their decisions to adopt a particular technology when it is also justified by other people's decisions (Vedadi and Warkentin, 2020; Lisana and Handarkho, 2022). Handarkho (2021) also stated that using other users' approval and evaluation is a shortcut people choose when facing uncertainty issues, including adopting a particular technology. It means the influence of people around the user significantly affects user confidence to adopt

a specific system, which also helps establish their trust in the system's safety (Gan *et al.*, 2017; Beldad and Hegner, 2018; Cheung *et al.*, 2020; Lisana and Handarkho, 2022). Thus, we proposed the following hypotheses:

H3. Social influence has a positive direct effect on users' intention to use MP.

H4. Social influence has a positive direct effect on trust.

H5. Social influence has a positive direct effect on self-efficacy.

Another environmental aspect believed to affect user intention and confidence in adopting MP is the availability of regulations that can make users feel secure in conducting financial transactions using the system (Lisana and Handarkho, 2022). This factor is also acknowledged by Yeh (2020) as an extrinsic construct that affects MP adoption. As Chaurasia *et al.* (2019) mentioned, regulations that do not address user concerns will negatively impact user intention, leading to a low system adoption rate. Therefore, customers need to know that the provided regulations will benefit them when they deal with various issues and risks attached to MP (Lisana, 2021; Liu *et al.*, 2015). Similarly, Fan *et al.* (2018) also stated that the quality of regulations that manage MP operations significantly impacts user perception of the system's trustworthiness. In detail, when vendors provide clear rules and procedures that handle security transactions in the platform, it will minimize users' worries about the risk of the system from potential fraud, leading to the formation of trust and confidence in system usage (Lisana and Handarkho, 2022; Fan *et al.*, 2018). It means that assuring reliable regulations will affect user perception toward the system's reliability to handle the financial transaction and other risks that come with it, affecting user confidence and trust and resulting in user intention to adopt the platform (Liu *et al.*, 2015; Choi *et al.*, 2020; Huang *et al.*, 2020). Therefore, the following hypotheses are proposed:

H6. Vendor regulation has a positive direct effect on user's intention to use MP.

H7. Vendor regulation has a positive direct effect on trust.

H8. Vendor regulation has a positive direct effect on self-efficacy.

As mentioned above, social influence factors are already considered to affect the adoption of MP. However, the influence of the social aspect is derived not just from the opinion of people surrounding the user but also from the number of other customers who adopt the system (Lee and Hong, 2016). In the context of MP adoption, increasing the number of people who use the system will bring value and benefits to others who also adopt the platform (Cheng *et al.*, 2019). This is also known as network externalities, which refers to the increase of MP value leading to behavioral intention due to increased users (Lisana, 2021). In detail, the enhancement of people using MP indirectly will elevate the other aspect that supports the operation of the system, such as the wide variety of merchants that supports payment using MP, deal proneness provided by the provider and other service costs that are more affordable (Bailey *et al.*, 2017). Related to individual behavior, the system's popularity, shown by the number of support services and users who have adopted it, is also thought to make people more trusting and confident about using MP (Vedadi and Warkentin, 2020). It means network externalities help boost user confidence in handling the potential risk attached to system usage, which leads to behavioral intention (Qasim and Abu-Shanab, 2016; Gong *et al.*, 2020; Lisana, 2021). Therefore, the following hypotheses are proposed:

H9. Network externalities have a positive direct effect on user's intention to use MP.

H10. Network externalities have a positive direct effect on trust.

H11. Network externalities have a positive direct effect on self-efficacy.

3. Research design and methodology

For this study, a cross-sectional field study design was adopted to validate the proposed theoretical model. This approach was chosen as it is suitable for measuring complex variables, particularly in cross-sectional research (Boudreau *et al.*, 2001). The decision to use this design was justified by its acknowledged enhancement of statistical result quality in determining the effect of predictors on dependent variables, as emphasized by Handarkho and Harjoseputro (2019). The study focuses on exploring constructs that influence users' personal traits in mobile phone (MP) adoption among Indonesian respondents, following the research designs of Neuman (2014) and Kline (2016).

A questionnaire was selected for its suitability to gather information from Indonesian MP adopters. The questionnaire was adopted and carefully constructed from previous studies with the help of a focus group consisting of five experienced mobile phone users. To ensure the questionnaire's reliability, previously validated tools from relevant research (referenced in Table 2) were chosen, aligning with established constructs used by this study. Professionals were also involved in the translation process to ensure that the Indonesian version of the questionnaire accurately represented the original content and remained contextually relevant. Furthermore, a pilot study was conducted to gather valuable feedback from selected respondents, contributing to the perfection of the questionnaire for the study's specific objectives.

The data collection used a purposive sampling method to select respondents who use MP at least once a month, ensuring relevance to the research objectives. The nonrandom sampling method is deemed appropriate when no suitable sampling frame is available (Neuman, 2014). The minimum number of respondents was set at 400 based on Israel's (2003) guidance to achieve a 5% precision and 95% confidence level. An online (using Google Forms) and offline self-administered questionnaire were used, following Neuman's (2014) recommendation for nonrandom sampling. This study used Google Form links for both online and offline distribution using self-administered questionnaires. To distribute the survey offline, it was given to the targeted group in four major cities of Indonesia, including Jakarta and Surabaya on Java Island, Denpasar on Bali Island and Makassar on Sulawesi Island. Local contacts in each of these cities provided assistance to carry out this process.

The reliability and validity of the questionnaire were measured through exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) following Neuman's (2014) approach. Based on the EFA approach, data is considered valid when the construct validity of each indicator was loaded significantly only to the latent variable, which loading factors for each indicator exceeded 0.4 in magnitude (Straub *et al.*, 2004). Meanwhile, the CFA method was run by conducting average variance extracted (AVE) and composite reliability (CR) analysis to ensure convergent validity with the required minimum value of CR and AVE with 0.7 and 0.5, respectively (Fornell and Larcker, 1981). Meanwhile, Cronbach's alpha coefficient was used to ensure the equivalence reliability of each construct with a minimum value of 0.7 based on George and Mallery's (2003) indicator. Finally, the discriminant validity was checked using the value of AVE square roots, which must be higher than the value from the correlation among other variables (Barclay *et al.*, 1995). Overall, the scale's individual and CR values and constructs were assessed to ensure consistency.

Finally, AMOS software was used to run a structural equation modeling (SEM) analysis to validate each direct, indirect and moderating effect proposed in the theoretical model

Variable (symbol)	Indicator	Measuring instrument	Adopted from
Trust (TR)	TR1	MP is a trustworthy service	Chauhan (2015)
	TR2	I can count on the MP to protect my money	
	TR3	I can count on the MP to transfer my money safely	
	TR4	The MP can be relied on to keep its promises	
Self-efficacy (SE)	SE1	It is easy to learn how to use MP to pay for purchases	Bailey *et al.* (2017)
	SE2	I have the necessary skills to use MP to pay for purchases	
	SE3	I am confident that I could figure out how to use MP to pay for my purchases	
Social influence (SI)	SI1	People who are important to me think I should use MP	Shankar and Datta (2018)
	SI2	People whose opinions I value are preferred me to use MP	
	SI3	People who are important to me (e.g. family members, close friends and colleagues) support me in using MP	
Vendor regulations (VR)	VR1	It is important for MP service providers to show users the formal regulations needed and the corresponding benefits	Fan *et al.* (2018)
	VR2	When using MP, I will follow all the rules, regulations and operating procedures needed	
	VR3	When using MP, I will read the instructions for every procedure needed	
	VR4	Regulations of MP are important to me because it can protect the safety of my account and my property	
	VR5	When using MP, I will follow the step-by-step instructions to make a payment	
Network externalities (NE)	If more and more merchants accept MP, then:		Bailey *et al.* (2017)
	NE1	the quality of MP services will improve	
	NE2	a wider variety of MP services will be offered	
	NE3	customers will have to pay less to use MP services	
Intention to use (IU)	If it is possible, then:		Lisana (2021)
	IU1	I intend to continue using the MP in the future	
	IU2	I will always try to use the MP in my daily life	
	IU3	I plan to continue to use the MP frequently	

Note: P2P = peer to peer
Source: Table created by authors

Table 2. Indicators and measuring instruments

based on Kline's (2016) guidance. In detail, the current study uses a latent structured regression (LSR) technique, which is part of SEM analysis. This approach is considered suitable for analyzing a theoretical model in which the structure is developed based on prior established theory (Schumaker and Lomax, 2016). Also, this technique can capture the directional effect and its correlations with other predictors, which is not handled by the regression technique that only focuses on one-way causation between two variables. In general, the LSR technique considers all the external latent variables as entirely latent constructs measured using the complete set of indicators. Unlike other regression techniques, such as path analysis, which treats latent variables as constructs with a single measure, the LSR model includes all the latent variables by directly using the indicators of each one of them, which can be run by AMOS software (Kline, 2016).

4. Theoretical model and measurement

Figure 1 shows the theoretical model proposed in this research. Meanwhile, all the measuring instruments used to validate the model can be seen in Table 2.

5. Result

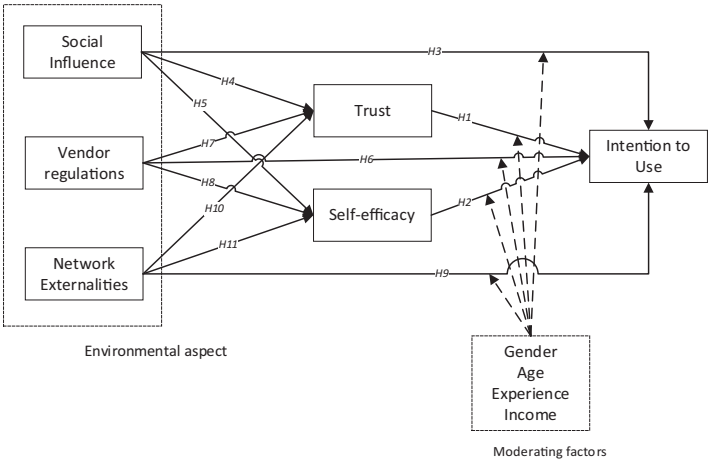
5.1 Data preparation and descriptive analyzes

A total of 736 feedbacks were retrieved to validate the proposed model. EFA analysis was run, and the result shows that all indicators are loaded significantly to each variable, showing that the construct validity for each indicator satisfies the requirement. Furthermore, the CFA method was run by conducting AVE and CR analysis to ensure convergent validity. The result shows that all values satisfy the required minimum value of CR and AVE with 0.7 and 0.5, respectively (Fornell and Larcker, 1981). Meanwhile, Cronbach's alpha coefficient was used to ensure the equivalence reliability of each construct, and the result satisfies the requirement based on George and Mallery's (2003) indicator. Finally, the discriminant validity was checked using the value of AVE square roots, which must be higher than the value from the correlation among other variables (Barclay *et al.*, 1995). All the results above are presented in Tables 3 and 4.

The characteristics of respondents classified by gender, age, experience and income are detailed in Table 5. The data showed that males, with 55.7%, were the dominant respondents. Regarding age, most respondents are either under the age of 25 (39.1%) or over the age of 35 (33%). Meanwhile, 83.3% of respondents said they used MP to handle more than five transactions within a month. Regarding income, the data show that the respondent groups with incomes below and above five million per month have similar percentages of 42.3% and 57.7%, respectively. This summary indicated that the respondent satisfies the requirement to validate the theoretical model.

5.2 The result of analysis of direct, indirect and moderating effect

Figure 2, followed by Table 6, provides the result of the SEM analysis, which is presented using the following format: *unstandardized effect* $^{statistical\ significance}$ *(standardized effect* $^{the\ magnitudes}$*)*. The symbols indicate the level of statistical significance *, **, *** or not



Source: Figure created by authors

Figure 1.
Theoretical model

Indicator	Vendor regulations	Trust	Social influence	Behavioral intention	Network externalities	Self-efficacy	Cronbach's alpha	AVE	CR
VR3	0.823						0.891	0.590	0.880
VR5	0.789								
VR4	0.782								
VR2	0.768								
VR1	0.767								
TR2		0.881					0.902	0.698	0.902
TR3		0.846							
TR1		0.829							
TR4		0.797							
SI2			0.899				0.913	0.768	0.909
SI1			0.883						
SI3			0.865						
IU2				0.866			0.906	0.652	0.849
IU3				0.860					
IU1				0.801					
NE2					0.859		0.867	0.711	0.881
NE3					0.851				
NE1					0.825				
SE2						0.850	0.798	0.591	0.812
SE1						0.785			
SE3						0.760			

Table 3. Factor analysis and Cronbach's alpha coefficient

Source: Table created by authors

Variable	T	NE	SE	SI	VR	BI
Trust	*0.835*					
Network externalities	0.353**	*0.843*				
Self-efficacy	0.294**	0.328**	*0.768*			
Social influence	0.302**	0.335**	0.290**	*0.876*		
Vendor regulations	0.308**	0.368**	0.357**	0.318**	*0.768*	
Intention to use	0.385**	0.370**	0.492**	0.418**	0.383**	*0.807*

Table 4. Discriminant validity

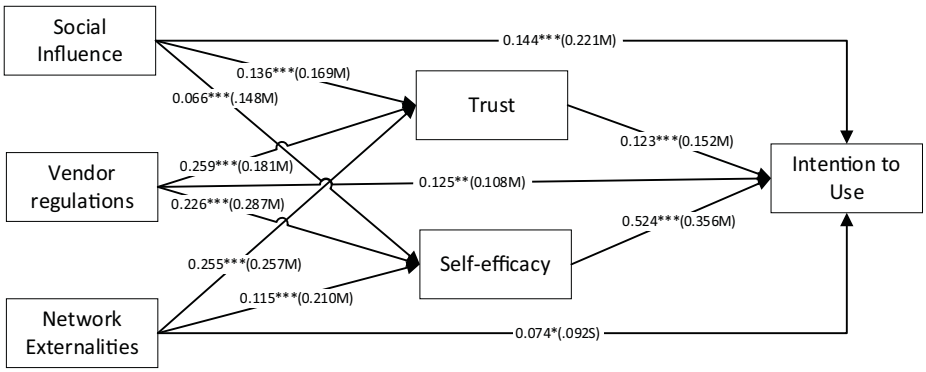
Note: The italicized value represents the square root of the AVE; **represent statistical significance at levels of 0.01, respectively

Source: Table created by authors

Measure	Items	Frequency	%
Gender	Male	410	55.7
	Female	326	44.3
Age	<25	288	39.1
	25–35	205	27.9
	>35	243	33.0
Experience	<5	123	16.7
(freq. use/month)	5–10	309	42.0
	>10	304	41.3
Income	IDR <5M	311	42.3
	IDR >=5M	425	57.7

Table 5. Respondents' characteristic

Source: Table created by authors



Source: Figure created by authors

Figure 2.
Result of direct effect in the theoretical model

Direct effect	Total effect	Status
Trust → Intention to use (*H1*)	0.123*** (0.152M)	Accepted
Self-efficacy → Intention to use (*H2*)	0.524*** (0.356M)	Accepted
Social influence → Intention to use (*H3*)	0.144*** (0.221M)	Accepted
Social influence → Trust (*H4*)	0.136*** (0.169M)	Accepted
Social influence → Self-efficacy (*H5*)	0.066*** (0.148M)	Accepted
Vendor regulations → Intention to use (*H6*)	0.125** (0.108M)	Accepted
Vendor regulations → Trust (*H7*)	0.259*** (0.181M)	Accepted
Vendor regulations → Self-efficacy (*H8*)	0.226*** (0.287M)	Accepted
Network externalities → Intention to use (*H9*)	0.074* (0.092S)	Accepted
Network externalities → Trust (*H10*)	0.255*** (0.257M)	Accepted
Network externalities → Self-efficacy (*H11*)	0.115*** (0.210M)	Accepted
Indirect effect		
Social influence → Trust → Intention	0.016*** (0.025S)	Accepted
Social influence → Self-efficacy → Intention	0.008*** (0.052S)	Accepted
Vendor regulations → Trust → Intention	0.0318*** (0.027S)	Accepted
Vendor regulations → Self-efficacy → Intention	0.118*** (0.102M)	Accepted
Network externalities → Trust → Intention	0.0313*** (0.039S)	Accepted
Network externalities → Self-efficacy → Intention	0.060*** (0.075S)	Accepted

Notes: The indirect effect was calculated using the heuristic method by Cohen and Cohen (1983); *, ** and *represent statistical significance at levels of 0.05, 0.01 and 0.001, respectively
Source: Table created by authors

Table 6.
Hypothesis testing results

significant, which stand for 0.05, 0.01, 0.01 or no significance, respectively. Meanwhile, the magnitudes are represented using S, M or L, which refers to a small, medium or large, respectively. The results of hypothesis testing are displayed in Table 6, demonstrating that all proposed hypotheses are accepted. The direct effect results show that self-efficacy is the most significant predictor of user intention to adopt MP (*H2*, $\beta = 0.524$, $p < 0.001$). Meanwhile, trust (*H1*, $\beta = 0.123$, $p < 0.001$) has a significant direct effect on intention. From an environmental aspect, social influence was found to be a significant predictor of intention (*H3*, $\beta = 0.144$, $p < 0.001$), trust (*H4*, $\beta = 0.136$, $p < 0.001$) and self-efficacy (*H5*, $\beta = 0.066$, $p < 0.001$). Meanwhile, the results of *H6* ($\beta = 0.125$, $p < 0.01$), *H7* ($\beta = 0.259$, $p < 0.001$) and

H8 ($\beta = 0.226$, $p < 0.001$) also was found to be significant. Finally, the effect of network externalities on intention (*H9*, $\beta = 0.074$, $p < 0.05$), trust (*H10*, $\beta = 0.255$, $p < 0.001$) and self-efficacy (*H11*, $\beta = 0.115$, $p < 0.001$) are also accepted.

The result of *H1* confirms prior studies that posited that user acceptance of the risk and susceptibility attached to MP was a significant predictor of MP adoption (Sleiman *et al.*, 2021; Lisana and Handarkho, 2022; Karsen *et al.*, 2019). The result of *H2* indicates that user confidence in their ability to use MP to complete their financial transaction significantly affects their intention to use MP, which is consistent with the findings of the prior studies (Lisana, 2021; Winarno *et al.*, 2021; Al-Sharafi *et al.*, 2022; Upadhyay *et al.*, 2022). The results of *H3*, *H4* and *H5* show that the influence of people around the user significantly affects user confidence and trust toward MP adoption, confirming the prior related findings (Cheung *et al.*, 2020; Lisana and Handarkho, 2022). Furthermore, the results of *H6*, *H7* and *H8* endorse prior studies that state the quality of regulations of MP significantly impacts user confidence and perception of the system's trustworthiness, leading to user intention to adopt the platform (Fan *et al.*, 2018; Choi *et al.*, 2020). Finally, the results of *H9*, *H10* and *H11* validate prior research that believes the enhancement of people using MP will elevate all aspect that supports the MP operation, encouraging user belief and confidence toward the platform usage (Bailey *et al.*, 2017; Vedadi and Warkentin, 2020; Lisana, 2021).

From an indirect effect perspective, the effectiveness of regulations set by vendors is the most crucial factor influencing user adoption of MP through self-efficacy and trust as a mediator construct, followed by network externalities and social influence. Hence, precise and reliable regulations will significantly enhance user confidence and trust in adopting MP (Choi *et al.*, 2020). Meanwhile, regarding the results of the moderating effect, Table 7 shows that only gender was found to have a substantial effect on the direct relationship between self-efficacy and intention to use, with male respondents being higher than female respondents.

Meanwhile, Table 8 presents the value of the fit statistic of the proposed model. The result satisfies the requirement provided by Kline (2016) with details as follows: the value of the normed chi-square is reasonable due to it being between 1 and 5; the model is considered a good model fit based on the value of goodness of fit index (GFI), incremental fit index (IFI), comparative fit index (CFI) and normed fit index (NFI) that above 0.9, and the value of root

Table 7.
Significant moderating effects

Moderator	Direct effect	Direct effect	Critical ratios for difference
Gender	*Male (410)*	*Female (326)*	
Self-efficacy → Intention	0.801*** (0.520L)	0.269** (0.191M)	4.031***

Notes: ** and ***represent statistical significance at levels of 0.01 and 0.001, respectively
Source: Table created by authors

Table 8.
Fit statistic for the proposed model

Sample size	Normed chi-square (NC) = $\chi 2$/df	RMR	GFI	AGFI	NFI	IFI	CFI	RMSEA
736	401.347/175 = 2.293 R^2: BI: 0.440; TR: 0.220; SE: 0.253	0.017	0.924	0.933	0.960	0.977	0.977	0.042

Note: R^2 is the proportion of the variance explained by the variables affecting it
Source: Table created by authors

mean square residual (RMR) and root mean square error of approximation (RMSEA) that is less or equal to 0.05.

6. Discussion

6.1 Direct, indirect and moderating effects

The findings in Table 6 indicate that self-efficacy has the most significant direct impact on user intention to use MP, followed by trust. This suggests that a user's confidence in their ability to handle financial transactions through MP is the most crucial factor that affects their intention to adopt it. This aligns with several previous studies (Mouakket, 2020; Lisana, 2021; Winarno *et al.*, 2021; Al-Sharafi *et al.*, 2022; Upadhyay *et al.*, 2022). A user with high self-efficacy is more likely to have confidence in facing any potential risks and threats associated with the system usage, leading to the adoption of MP. The study also confirms trust as another personal trait directly impacting users' intention to adopt MP. It means that a user's acceptance of the vulnerability of MP minimizes their risk perception toward system usage, leading to adoption behavior. This is consistent with previous related studies (Lisana and Handarkho, 2022; Sleiman *et al.*, 2021; Karsen *et al.*, 2019).

From an environmental aspect, the result shows that social influence is the essential construct that directly influences user intention to adopt MP (*H3*), followed in decreasing order of significance by vendor regulations (*H6*) and network externalities (*H9*). In detail, this study confirms the findings from the existing studies (Upadhyay *et al.*, 2022; Winarno *et al.*, 2021; Lisana, 2021), showing that the opinions of people they think were essential affect their decision to adopt MP (*H3*). Also, users like to adopt other behaviors to justify their decision to adopt MP, especially when facing uncertainty issues and risk (Vedadi and Warkentin, 2020; Handarkho, 2021). Another finding revealed that the quality of regulations significantly impacts user adoption of MP (*H6*), which aligns with several prior studies (Lisana and Handarkho, 2022; Yeh, 2020; Chaurasia *et al.*, 2019). It means that when vendors can provide accurate and trustworthy regulation, it will reduce users' concerns about the potential dangers posed by the system, which will result in a greater desire to use the system (Chaurasia *et al.*, 2019; Fan *et al.*, 2018). Finally, this research also discovers network externalities as a significant direct predictor of user MP intention (*H9*), supporting the findings from Lisana (2021), Qasim and Abu-Shanab (2016) and Gong *et al.* (2020). It means that when the number of users increases, it will deliver value and benefits perceived by the consumer that affect their intention to adopt the platform (Cheng *et al.*, 2019). Specifically, the increase in MP users will cause the enhancement of other services attached to the operation of the system, such as a lower service cost and a higher number of merchants that support payments using MP, which will encourage user intention to adopt the system (Bailey *et al.*, 2017).

This study provides further evidence in support of the hypothesis that environmental aspects significantly affect users' personal traits related to MP adoption. In detail, according to the findings of this research, the self-efficacy and trust levels of users are influenced, in descending order of significance, by vendor regulations (*H7*, *H8*), network externalities (*H10*, *H11*) and social influence (*H4*, *H5*). This highlights the importance of clear and reliable regulations for financial transactions in boosting user confidence toward adopting MP (Choi *et al.*, 2020). Furthermore, the number of support services, such as the higher number of merchants that support payments using MP, also increases user trust and self-confidence in handling payments using the system (Vedadi and Warkentin, 2020). Finally, this study demonstrates that users are more likely to be confident in using a system and begin gaining trust when it is supported by other people's behaviors and opinions, which is consistent with other similar research (Handarkho, 2021; Vedadi and Warkentin, 2020). In addition, vendor regulations are found to be the most substantial factor that indirectly

affects user intention through self-efficacy and trust as a mediator, as shown in Table 6. Finally, according to the moderating effect results, only gender significantly influences the association between self-efficacy and user intention to use MP. The result can be interpreted to mean that males tend to perceive their self-confidence in managing the system as a substantial factor that affects their intention to adopt MP, compared to females.

6.2 Theoretical implication

This study observes the influence of environmental aspects on users' characteristics related to MP adoption. In the context of personal trait study, most analyses of MP only investigated trust formation and consequently ignored other individual factors that also affect MP adoption. Therefore, this study proposes an alternative theoretical model to fill the gap by discussing the development of user confidence to initiate and maintain the use of technology to carry out their goal. Specifically, a model was developed to explain the formation of trust and self-efficacy in the context of MP adoption by involving TPE as a predictor of both proposed personal traits above.

In addition, the inclusion of self-efficacy contributes to the body of knowledge by enhancing the comprehension of the role of a personal trait in MP adoption, which has not been thoroughly explored in prior research. In detail, TPE was used as a ground to propose three factors from the environmental aspect (social influence, vendor regulations and network externalities). These constructs were adopted to explain how external influences influence user trust and self-efficacy in relation to the adoption of MPs. From a technical aspect, this study also involves a comprehensive analysis by analyzing direct, indirect and moderating effects toward the predictor of MP adoption. Finally, this study presents a novel technique that has not been extensively explored in previous research, thereby making a valuable contribution to the existing body of knowledge.

6.3 Practical implication

The result reveals that self-efficacy has the most substantial impact in predicting user intention to adopt MP, followed by trust. It means the extent to which the user believes in his ability to carry out their financial transaction using MP becomes an integral factor influencing their intention to use MP, followed by the system's ability to make users accept the risk and susceptibility attached to MP, leading to trust development. Literally, self-efficacy and trust complement each other and encourage MP adoption. This study recommends several practical ways to enable users to gain trust and confidence in their usage of MP, primarily related to the Indonesian context.

From the indirect effect analysis, vendor regulations affect user self-confidence and trust in adopting MP. Therefore, vendors need to ensure they can provide rules and instructions that are straightforward to follow, primarily when related to operational payment safety and recovery using the system. By giving clear, step-by-step instructions, users will feel more confident using MP to self-administrate their financial transactions. This regulation might pertain to pretransaction and posttransaction, including transaction error resolution that harms the consumers. Moreover, vendors also need to provide a channel to communicate their regulations to their customers through many alternatives such as websites, social commerce and other online media, including vendor representatives that can explain the procedure when users need clarification with the step. This strategy will help users be confident and minimize their worries about the system's risk of potential fraud, leading to the formation of trust and confidence in adopting MP. Practically, the vendor needs a team that specifically focuses on managing their social commerce to ensure all customer queries can be addressed appropriately. This will encourage customers to develop emotional engagement with the vendor, leading to trust,

especially for individuals encountering difficulties and trouble with their transactions. For example, by providing a team that routinely answers every question and provides a responsive solution for customer problems in social commerce, the user will feel valued, encouraging their emotional bonding with the platform and leading to trust development. However, offline offices are still essential for building customer trust, especially in developing countries like Indonesia. Many users still prefer to meet with vendor representatives in person instead of online when they have service-related issues.

The other environmental constructs affecting self-efficacy and trust are network externalities and social influences. It means strategies that can elevate MP value by enhancing the positive opinion and review, the number of users and other services that support the system's operation will increase user self-efficacy and trust toward MP adoption. In this case, social commerce is still considered the best strategy to increase the value of MP and increase people's awareness of the benefits of MP usage.

In detail, social commerce refers to the use of social network sites as platforms that depend on user opinions and reviews to influence others' potential. This strategy is considered influential because people will receive information from another user rather than a vendor, which is regarded as more reliable. Using this strategy, vendors can provide a platform that allows people to receive information and share their opinions about merchants and additional services that support transactions using MP. In detail, vendors use social media such as Facebook, Instagram, TikTok or Twitter as a social commerce platform to introduce their MP services and allow users interested to discuss and ask questions through the platform. Furthermore, vendors can monitor these discussions and provide real-time feedback to users. This communication can affect user trust and confidence in adopting the MP system. Other strategies can also be derived from the social influence aspect, in which people tend to be encouraged when their behavior is justified by another person who is considered essential to them. Consequently, the vendors must encourage their users to participate in social commerce. This approach might be executed using monetary rewards, such as vouchers or redeemable points, to encourage customer participation in the forum. Furthermore, using an influential person endorsement strategy in social commerce, such as a celebrity, might be a good choice because individuals tend to follow the suggestions of people they idolize, forming trust and confidence in adopting MP. Despite having access to information through SC, however, some Indonesian customers still prefer shopping on the MP official website or in physical stores, which prevents them from being affected by this approach (Nurhayati-Wolff, Hanadian, 2023). Therefore, vendors can organize community workshops or information sessions to reach this customer. These events can be held in public spaces and promoted to build trust and confidence in adopting MP. This traditional approach uses direct interaction and information sharing to encourage more customers to use MP.

However, it is essential to mention that the practical action proposed in this study is based on data derived from Indonesian society, which might have a different culture and habits from other geographic locations. Furthermore, the level diffusion of the MP system in each country might be different, so the practical recommendations in this study might be applicable only in other societies with similar cultures and levels of technology penetration.

7. Conclusion

This study aims to provide an alternative perspective on the factors affecting the adoption of MP by exploring the impact of personal traits and environmental aspects. This study applied the TPE theory to establish that user confidence in handling financial transactions through MP is the most substantial personal factor affecting system adoption. The findings show that self-efficacy is the most significant factor directly affecting user intention to use MP, followed by social influence, trust, vendor regulations and network externalities. This

approach is distinct from prior studies by focusing on the formation of user self-efficacy affected by environmental aspects and provides a novel contribution to the literature.

Furthermore, the study revealed that social influence is the most prominent environmental factor influencing user intentions directly and indirectly through trust and self-efficacy as mediators. The moderating effect analysis demonstrated that gender moderates the effect of user self-efficacy on MP adoption. The study concludes that environmental aspects and users' personal traits significantly determine their inclination to adopt MP. It also contributes to investigating how environmental constructs affect individual personality traits associated with MP adoption. Overall, this research discusses explicitly the impact of external factors that encompass all the circumstances around the operation of MP on user personal traits, which directly and indirectly influence MP adoption.

However, the study has some limitations by only considering trust and self-efficacy as factors derived from personal traits; therefore, future studies can include other personal constructs. Additionally, because the study only involves Indonesian respondents, the findings may not be generalizable directly to other geographical areas. Thus, cross-cultural research is recommended to provide a better understanding of the association of environmental constructs on user personal traits related to MP adoption.

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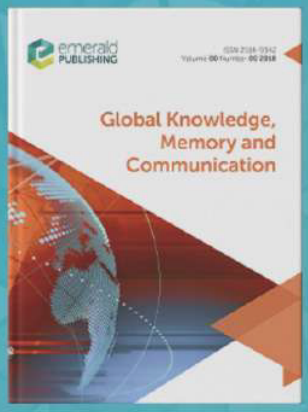

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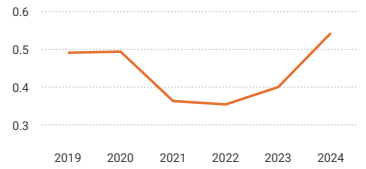

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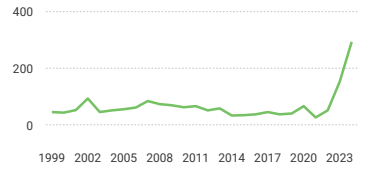

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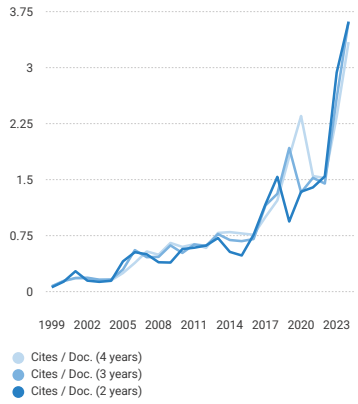

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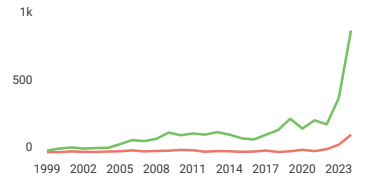

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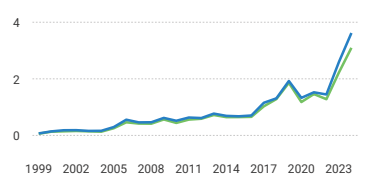

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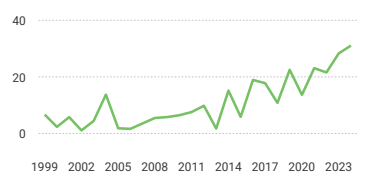

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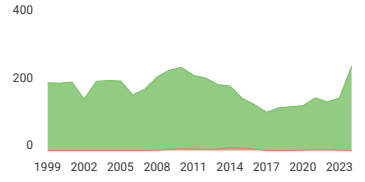

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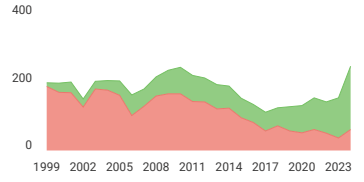

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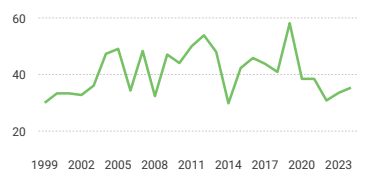

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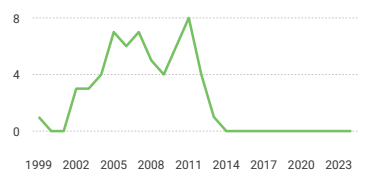

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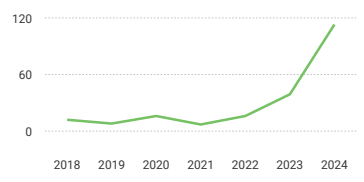

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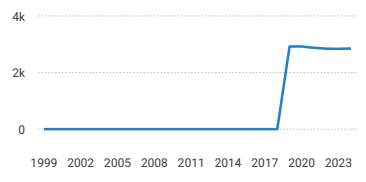

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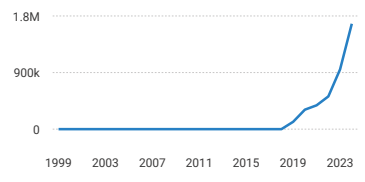

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