

Innovation recipes for high use on four Fintech types: A configurational perspective

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ABSTRACT

Fintech has attracted attention based on its fusion of technology and finance; however, how its elements should be combined and configured has yet to be explored. To fill this research gap, this study investigates specific and multiple configurations of Fintech attributes that lead to high use by adopting a fuzzy-set qualitative comparative analysis. Based on the diffusion-of-innovation theory and the information systems success model, we develop a theoretical framework using three dimensions of Fintech: innovation, financial services, and information technology (IT). This study then explicates the complex nNar relationships among these three dimensions in the form of the conjunction, equifinality, and asymmetry of Fintech attributes to develop a better understanding of its use. This study provides specific configurations of these interactions among seven Fintech attributes based on four Fintech types (mobile payments, mobile remittance, peer-to-peer (P2P) lending, and crowdfunding). The findings indicate that IT plays multifaceted roles, varying from enabling to counterproductive, for all Fintech types. Our results offer guidance on effectively coordinating Fintech development and launching strategies to enhance its use in managerial practice.

1. Introduction

Fintech has emerged as a new paradigm in the financial industry combining finance with information technology (IT). According to KPMG [58], in 2022, global Fintech investment and deal volume reached 7,321 deals valued at 238.9 billion USD. As of May 2023, 11,651 startups were operating in the Americas, 9,681 in Europe, the Middle East, and Africa, and 5,061 in the Asia-Pacific region [112], becoming a global phenomenon.

As a new and innovative service, Fintech offers promising opportunities to overcome growth limits, increase market volume, and even reshape existing financial markets by changing consumer perceptions of financial services. Fintech innovation has shifted the focus of financial service offerings from institutions to users. Fintech overreaches the existing value chain and improves financial transaction efficiency by bypassing extant channels, offering users convenience [25,36,59]. Although the link between financial services and IT is not novel, the expanding role of IT is a significant Fintech characteristic. Fintech uses IT to expand financial innovations from back-end to front-end payments, cross-border transfers, personal finance, retail banking, lending, and cryptocurrencies [36]. In this sense, it is a disruptive innovation, as it

enhances, unbundles, re-bundles, and reshapes existing financial services with promises of lower costs, higher efficiency, greater convenience, and product customization, particularly by utilizing IT.

Fintech encompasses various dimensions that users should consider when contemplating its utilization, given its deliberate integration of innovative financial services and IT. Furthermore, Fintech's multidimensional nature can complicate the understanding of its use. Moreover, comprehensively capturing the extent of Fintech usage becomes even more intricate due to the combined delivery of its diverse characteristics to users [35]. That is, while a user's focus on a particular characteristic leads to distinct behavior (high use or not-high use), which behavior occurs when a user simultaneously pursues multiple characteristics remains relatively unknown. The non-linear and interconnected nature of these characteristics further heightens this complexity. For instance, Nalluri and Chen [83] found that antecedents to Fintech adoption do not operate independently; instead, they interact with and depend upon each other. For example, in their study, safety and reliability issues operate independently but they are also easily affected by changes to other factors, such as a lack of trust in Fintech. This implies that changes in one factor can affect the functioning of other factors. Similarly, Yang et al. [131] identified three configurations that influence high gamified

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mobile wallet usage, suggesting that certain factors either should be avoided or are unnecessary for generating high usage. Therefore, a comprehensive understanding of Fintech usage cannot consider the impact of each dimension independently; instead, it should embrace the configurations arising from the complex interactions among these dimensions.

The potential consequences of ignoring this complex interaction can be as follows. As IT provides an interface for users to interact with Fintech, IT's effect on Fintech use can easily be underestimated as being a mere tool. However, Fintech's delivery to users is tailored not only by financial services characteristics but also IT and the appropriate and sometimes innovative alignment between the two. For instance, security and privacy issues severely affect Fintech use. However, these issues can be aggravated or mitigated depending on the availability of innovative technologies such as fraud detection systems and authentication algorithms, including fingerprint recognition, iris scan, and retina scan. Certain IT characteristics and their interdependency with other Fintech attributes can thus strengthen how a financial service is delivered to users. However, it is worth noting that research adopting a configurational approach to understanding the Fintech phenomenon remains limited [131]. Most existing Fintech research has primarily examined the effects of various factors based on the linear net effect of independent individual variables, such as technology-acceptance-related factors [28,42,47,108,119], user innovativeness [108,119,126], and trust- and risk-related factors [14,28,42,47]. The research has yet to thoroughly investigate the systematic patterns emerging from the complex nonlinear interactions among multiple attributes within Fintech.

To bridge these research gaps, we adopt a configuration approach to investigate Fintech use. This study aims to validate three key propositions (conjunctural, equifinal, and asymmetric relations) from the configuration approach: (1) Fintech use is determined not by particular attributes but by the interdependency of various attributes; (2) multiple configurations of Fintech attributes may lead to the same outcome (i.e., high use or not-high use); (3) the fact that a Fintech attribute supports high use does not necessarily mean that its absence will lead to not-high use.

To verify these propositions, starting from the general Fintech definition, which suggests innovative financial services driven by IT, we first identify Fintech's essential dimensions from its various definitions within the existing literature and incorporate them into a theoretical framework based on Rogers' [98] diffusion of innovation (DOI) theory and the information systems success model. Using this theoretical framework, we next examine the specific attributes that influence Fintech use and focus on building configurations of these attributes. In this process, we select four prevalent Fintech types (mobile payments, mobile remittance, peer-to-peer [P2P] lending, and crowdfunding) to provide insights into configurations for use, as Fintech services differ in their financial functions [35], and thus can engender varying configurations depending on the type. We then suggest viable propositions from multiple alternative patterns to achieve high Fintech use. The value of our investigation derives from our explication of these specific configurations.

For this purpose, we analyzed empirical data from 254 Fintech users (69 mobile payments, 66 mobile remittance, 62 P2P lending, and 57 crowdfunding users) in South Korea with over three months of related experience to investigate which configurations of Fintech attributes are linked to high use. A fuzzy-set qualitative comparative analysis (fsQCA) [95] was undertaken to identify specific combinations of interlinked Fintech attributes. fsQCA has been used in various academic fields to provide a deeper and richer understanding of a research question through data analysis. This exploratory study is an early theoretical attempt at the individual level to show through fsQCA that different Fintech attributes are interrelated and interdependent in engendering individuals' Fintech use. Our study illustrates an optimal method for promoting Fintech use involving multiple patterns of interrelated drivers. Our findings can help practitioners determine the most efficient

strategies for encouraging more Fintech use.

2. Theoretical background and framework: Fintech dimensions

The existing research defines Fintech as innovative financial services [25,36,59] driven by IT [4,25], implying that Fintech is a combination of two (finance and IT) or multiple dimensions. We investigate the related literature to identify Fintech dimensions more concretely, as these definitions are inevitably explained by integrating Fintech dimensions.

Arner et al. [4] refer to Fintech as "technology-enabled financial solutions" (p. 1), emphasizing that IT delivers these financial services. Kuo Chuen and Teo [60] define it as "innovative financial services or products delivered via new technology" (p. 26). Ryu [100] clarifies it as "innovative and disruptive financial services, where IT is the key factor" (p. 543). Schueffel [104] proposes it as "a new financial industry that applies technology to improve financial activities" (p. 45) after reviewing more than 200 articles relevant to Fintech. Bureshaid et al. [12] posit that Fintech is "an innovation that will revolutionize the financial sector" (p. 126). These definitions all use words such as "new" or "innovation" to indicate how Fintech is experienced by its users. Because newness is an attribute of innovation, we define *innovation* as a Fintech dimension that embraces both newness and innovation. Also, all definitions use a variation of the word *finance* (financial industry [or sector], financial activity, or financial service). Because we aim to understand Fintech from the user perspective rather than the institutional perspective, we use the term *financial services* as a dimension in this study. In addition, *technology*, particularly *IT*, is emphasized in most definitions; thus, we employ IT as a dimension. Most previous research has considered the drivers of Fintech use in terms of these three dimensions: innovation-related factors [87,100,103,120], financial-related factors [14,28,42,47,50,51], and technology-related factors [28,42,47,108,119].

As the Fintech definitions and the related literature agree that Fintech has three key dimensions—innovation, financial services, and IT—understanding Fintech use requires research based on these dimensions. Therefore, we define Fintech as innovative financial services driven by IT. Using this definition, we next attempt to identify each dimension's attributes influencing Fintech use. As many attributes can belong to each dimension, we first set the boundary and scope by building a theoretical framework. We begin by considering the literature on innovation adoption, as it can reveal the specific attributes that drive people to adopt innovative services combined with technology, such as Fintech. Then we use this theoretical basis to select the most influential attributes from the three identified dimensions.

First, as Fintech offers users innovation, we use the diffusion of innovation (DOI) theory for the first dimension of the theoretical framework. Rogers' [98] DOI theory is at the center of the innovation adoption literature, as it explains what initiates and accelerates the use of an innovation among individuals. Because this theory provides a well-understood description of how individuals adopt and use innovations, it is widely accepted and used as a starting point in the related literature [65,66,102,121].

Second, as Fintech provides financial services, we expand the DOI theory by using innovation literature related to the second dimension to explain financial service characteristics. As innovations in Fintech may be related to new service providers and transactions made possible by IT [4,100], we focus on innovation literature that refers to service adoption, using it to identify Fintech's financial service dimension attributes.

For the third dimension, we adopt an information system (IS) success model to describe IT's role in Fintech. Many technological innovations have been introduced through the development of technology, so the adoption of these innovations composes a large part of the related literature [121]. As the theoretical framework for this study, we use DeLone and McLean's [22] information systems success (ISS) model, because improving IT quality is a significant concern for Fintech

companies as it is a key driver of Fintech innovation [25]. Thus, high-quality IT is essential for Fintech to derive value by creating new financial business models, providing innovative financial services, and offering new service delivery channels with low transaction costs. Given the critical role of IT in the success of Fintech businesses, users might perceive IT quality to be the same as overall Fintech quality, indicating that IT quality is key in influencing Fintech use. Therefore, the ISS model, which focuses on IT quality, will be useful in our framework. The suggested Fintech dimensions and their theoretical framework are illustrated in Fig. 1.

3. The configurational model of Fintech adoption

3.1. Causal condition one: Three innovation attributes

Within the related literature, the perceived attributes of innovation are generally understood to be the major drivers of innovation adoption [33,43,78,80,81]. Innovation adoption attributes encourage users to adopt an innovation and thus are the foundation for spreading innovation among users. Many innovation adoption studies have used Rogers' [98] DOI theory as their basis and further developed it. The original DOI theory suggests that the following five innovation attributes promote adoption: relative advantage, compatibility, complexity, trialability, and observability. Afterward, Ostlund [88], Hoeffler [45], and Littler and Melanthiou [68] added risk as an attribute that affects the speed of innovation diffusion. Specifically, in the field of service adoption, Arts et al. [5] added uncertainty to Rogers' [98] five attributes to highlight its importance at the intention stage of service innovation adoption. For this study, we consider innovation attributes that can specifically affect adoption and be used in Fintech: relative advantage, compatibility, complexity, trialability, observability, risk, and uncertainty. No consensus has been reached about which innovation attributes best explain Fintech, and many researchers have selected only a subset of those attributes to explain the specific characteristics of Fintech innovation [1,71,114,130]. For this work, we have considered each attribute and selected those that align well with Fintech's innovative characteristics.

First, *relative advantage* refers to the perceived superiority of new offerings over alternatives in terms of quality and function [33]. It is an internal adoption factor, showing that users' perceptions of service characteristics are pivotal in adoption [120]. Because Fintech innovation is proposed to replace traditional financial services, relative advantage is a critical attribute motivating users. Therefore, relative advantage is included in the set of innovation attributes.

Second, *compatibility* aligns well with Fintech. It is also an internal adoption factor and reflects past experiences, beliefs, and motivations [27,120]. Compatibility is broadly defined as the degree to which innovation is perceived to be consistent with existing products or

services, past experiences, lifestyle, and the needs of potential adopters [5,98]. For this study, we narrowed its boundary to the Fintech context by adopting *meaningfulness*, which reflects the essence of compatibility but has a better focus on service use. *Meaningfulness* describes the degree to which a new service appears valuable to users and can satisfy their needs [17].

We excluded complexity, observability, and trialability from the attributes because they do not fit the Fintech context well. Regarding complexity, many studies found that it did not affect Fintech adoption or use [47,59]. Therefore, measuring the degree of complexity may not provide useful insights in the Fintech context. Observability is omitted because Fintech is highly personalized in its treatment of individuals' sensitive financial information [11,109], making it difficult to observe. Similarly, trialability was excluded, as financial information is sensitive and personal, so Fintech cannot be provided on a trial basis. In addition, although the essential benefit of trialability is decreasing a service's uncertainty and risk, trial use in Fintech cannot decrease the uncertainty and risk of financial consequences.

A high level of uncertainty and the risk of financial loss can cause users to hesitate before using Fintech [100], which makes them critical attributes. However, in the service-related literature, uncertainty is often used interchangeably with risk, as risk can include uncertainty about an outcome [116]. Moreover, regarding innovative services, users' perceived risks are often defined as their perceptions of uncertainty about the adverse consequences of using a service [24]. Therefore, perceived risk is a more suitable attribute than uncertainty in this context. We consider perceived risk as a comprehensive concept reflecting the uncertain functional, social, and financial consequences of adopting and using Fintech. Our definition of perceived risk is adopted from Hoeffler [45] and Littler and Melanthiou [68] and it is defined as the perceived degree of uncertainty and negative consequences of using a new service.

In summary, given that Fintech is an innovation disrupting the financial industry to satisfy the demands of users, we selected three attributes for the innovation dimension: *relative advantage*, *meaningfulness*, and *perceived risk*. These attributes saliently affect use during the decision process [87].

3.2. Causal condition two: Two attributes of financial services

As Fintech is an IT-driven business model with unique financial features, its use is influenced by characteristics specific to financial services, as well as those common in innovative services and IT [61,90]. As a financial service, Fintech often operates in environments with high perceived risk, such as the potential of malfunctioning financial transaction systems or financial fraud [100]. Thus, people do not fully trust online exchanges of money and personal information [46]. Given that users consider the monetary aspect of Fintech transactions important, companies must ensure that users perceive them to be trustworthy. In this sense, much of the Fintech adoption and use literature indicates that trust is an important antecedent of use [47,84,101,133].

Financial losses and damage from using Fintech can be caused by various factors related to a service provider. These include a lack of safety nets for new providers, misuse of personal data, security failures leading to financial fraud, criminal use, and hacks, representing the main vulnerabilities of new digital financial services [100]. Thus, as some users perceive Fintech services as risky [37,56], providers must emphasize that financial services are safe [132], concentrating primarily on the safety of customer assets [125]. Governments also mandate that service firms provide safe and reliable financial services to protect and maintain user assets legally and systematically, ensuring users feel secure in their financial transactions [118,125]. Therefore, when a user decides to use a service, their relationship with the service providers influences the adoption decision along with the service characteristics [21,106]. Additionally, the role of service providers is particularly critical when the service is complex [18]. Therefore, we suggest that

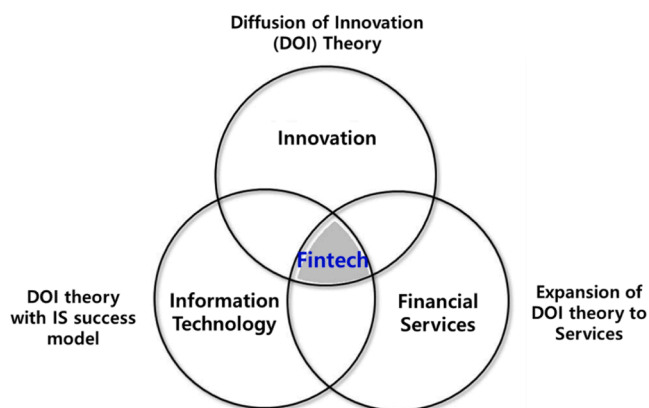


Fig. 1. Theoretical framework of the three Fintech dimensions.

trust in service providers and transactions are suitable attributes for the financial services dimension.

Hillman and Neustaedter [44] classified trust, which can encourage m-commerce, as characteristic-based, process-based, and institutional-based. Among these, we have adopted institutional-based and process-based trust as the main attributes of the financial services dimension. Process-based trust refers to trust built through a history of transactions, whereas institutional-based trust is trust in a provider's abilities, integrity, and intentions [3,72]. Characteristics-based trust is excluded because it deals with moral and ethical habits between users and companies [72], making it unsuitable for this study.

Structural assurance is the representative attribute of institutional-based trust. Structural assurance refers to an individual's perception of the institutional structures offered by a service provider, such as legal, governmental, contractual, and regulatory structures [74,76]. Structural assurance ensures compensation for financial losses caused by service faults and the security of user information and privacy; thus, it helps build initial user trust in new organizations such as Fintech companies [34,77,136]. Structural assurance influences the adoption and use of Fintech, such as mobile payment systems [15], and positively affects trust in service providers, increasing use [76]. A high level of structural assurance allows users to feel secure in using Fintech, enabling them to overcome their fears of financial loss and personal information leakage. Thus, we adopt *structural assurance* in this study, which is defined as a user's belief that Fintech companies have protective legal or regulatory structures to ensure that their business can be conducted safely.

For process-based trust, we adopt trust in transactions. Trust allows participants to be highly satisfied with the transactions [32,67]. It can reduce a user's risk perception and increase their Fintech use. For example, trust in online payment transactions increases the use of mobile payments [138]. Process-based trust ensures the safety and reliability of mobile payment transactions [44]. Hence, *trust in transactions* is defined in this study as the user's belief that Fintech transactions are trustworthy, increasing its high use.

3.3. Causal condition three: Two attributes of IT

This study uses the ISS model to investigate Fintech's IT dimension [22]. In the ISS model, DeLone and McLean [22] contend that system quality and information quality are critical factors in determining the success and use of individual IT systems. Therefore, these two factors have been used widely to examine the success of various IT systems [16, 55,62,137]. Considering that Fintech systems are developed using IT, these two factors can also be used as the main attributes of the IT dimension affecting Fintech use.

System quality refers to access speed, ease of use, navigation, and visual appeal [23,69]. Lee and Chung [62] demonstrate that a user's first impressions are formed when they experience the quality of an IT system. When people experience a high-quality system, they are likely to trust the connected service, be willing to use it, and financially invest in it [76]. However, poor system quality undermines user trust, causing dissatisfaction with Fintech systems and decreasing their use. Thus, we define *system quality* as users' perception of quality manifested in the overall performance of Fintech systems.

Information quality represents the relevance, sufficiency, accuracy, and timeliness of information provided by companies [74,85]. For example, users expect to pay for their products or services using mobile payments and receive their payment information anytime and anywhere. If the payment information is insufficient, inaccurate, or outdated, users may doubt the overall capability of the Fintech company providing it [62,135]. Low-quality information can increase a user's search and information-processing costs [40,93]. Given that users tend to be reluctant to make considerable efforts or spend time searching and assessing financial transaction information, low-quality information decreases Fintech use. Therefore, in this study, *information quality* refers to user perceptions of the quality of information provided by using

Fintech systems.

Using our theoretical framework, we propose that Fintech use can best be explained by examining the simultaneous interactions among its seven attributes within the three dimensions (innovation, financial services, and IT) and by identifying the salience of each attribute depending on different types of Fintech (mobile payments, mobile remittance, P2P lending, and crowdfunding). As such, this study focuses on the configurations of the seven attributes rather than the influence of each attribute to explore how patterns emerge from interactions among the attributes. However, it is often difficult to find an optimal configuration that effectively produces an outcome that is consistent with arguments from existing literature [92,115]. Therefore, we first suggest the following research model shown in Fig. 2 and then theorize the interdependencies and configurations of the seven attributes based on our empirical results.

3.4. Study context: The four types of Fintech

Among the many functional domains of Fintech, such as asset management, crowdfunding, cryptocurrencies, financial planning, insurance, lending and financing, payment and money transfer, P2P lending, and trading [35], we specifically selected mobile payments, mobile remittance, P2P lending, and crowdfunding as our study contexts. The top five globally adopted consumer Fintech domains are money transfers and payments (75%), insurance (48%), savings and investment (34%), budgeting and financial planning (29%), and borrowing (27%) [26]. In the case of South Korea, where we conducted this study, payment settlement (21.8%), capital intermediation and asset transactions (15.73%), asset management (9.58%), security authentication (8.68%), and data analysis (8.58%) are the top five Fintech types [111]. Considering these two sets of statistics for choosing prevalent Fintech domains based on region and availability as independent Fintech services, we determine that the four Fintech types used in this study are representative of Fintech use: mobile payments and mobile remittances for money transfers, payments, payment settlements, and asset transactions. The types also comprise P2P lending and crowdfunding for borrowing, investing, capital intermediation, and asset management. Thus, multiple Fintech types can reveal the commonalities and differences in Fintech characteristics, helping to generalize the study findings further.

These four Fintech types can be defined as follows. Mobile payment is a payment process for services, digital and hard goods, and bills using mobile devices by leveraging wireless and other communication

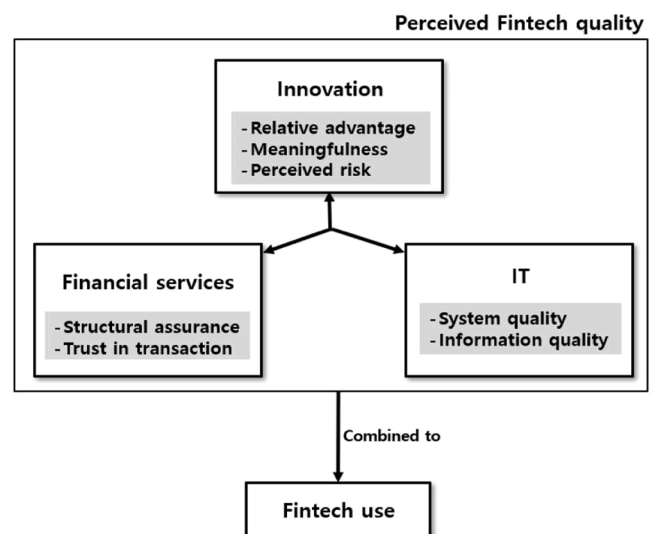


Fig. 2. Research model.

technologies [19,20]. Mobile remittance is a process in which money is sent via mobile devices and received into a transaction account, such as a bank account, a microfinance institution account, or a mobile money account [79,129]. P2P lending is the process of lending money to individuals or businesses through an online platform that directly matches lenders with borrowers [6,10,123,134]. Finally, crowdfunding refers to providing a funding process for a project or venture by raising money from a large number of people, typically through an online platform that directly matches funders (or backers) with creators (or creator groups) [64,82,113].

4. Research methods

4.1. Development of measurement

The research construct survey items for this study were developed from an intensive literature review to ensure content validity. Multiple-item measures were obtained from the innovation and IS literature to measure (1) the three attributes of the innovation dimension (relative advantage, meaningfulness, and perceived risk), (2) the two attributes of the financial services dimension (structural assurance and trust in transactions), and (3) the two attributes of the IT dimension (system quality and information quality). As the outcome of our research model, Fintech use was measured using three items from Lee [63] and Ryu [100]. The seven constructs and one outcome were measured using a seven-point Likert scale (1 = “strongly disagree,” 4 = “neither agree nor disagree,” 7 = “strongly agree”; for measurement items, see Appendix A).

4.2. Sample and data collection

Data was collected for our study over three weeks in April 2017 in South Korea. The data collection process was outsourced to Embrain Co. (www.embrain.com), a prominent market research company in Korea with more than 1.8 million panels across various Asian countries. The company first sent email invitations to the targeted panels for our main survey. If they agreed to participate, they were directed to the survey website. To help participants understand the concept of Fintech, we provided broad definitions of Fintech and introduced the four Fintech types and their examples. For the sampling method, we used stratified sampling to collect evenly distributed user groups across four Fintech types. As the initial screening question, we asked whether participants had actively used one or more of the Fintech types for more than three months. Only those who responded positively to the initial screening question were further asked to choose the Fintech type they primarily use among the four Fintech types. Then they were invited to complete the full questionnaire about their choice (they were asked to answer questions by thinking about the single service they primarily used). Among the 1,000 panels invited, 293 responses were collected with the stratified sampling method (a response rate of 29.3%), and 39 responses with missing values were eliminated from the dataset. In the end, the final dataset for this study included 254 respondents. Table 1 summarizes the respondents’ characteristics. Most respondents had used Fintech weekly (26.0%) or daily (9.8%) within the past year (74.8%). The respondents aged 40–49 years (28.7%) represent the largest proportion, and most held a bachelor’s degree (61.0%).

4.3. Measurement validity

To examine the research constructs’ validity, we first tested the loadings and cross-loadings for each item of the constructs by conducting confirmatory factor analysis (see Appendix B). The lowest factor loading value was 0.713, and all items’ loadings on their constructs were higher than those on other constructs, suggesting a satisfactory level of convergent and discriminant validity [41]. Next, we tested the reliability of the measures. As shown in Table 2, Cronbach’s α and the composite reliability (CR) values were above the threshold of 0.7 [7], indicating

Table 1
Respondent profiles.

Fintech type	Frequency	Percent	Gender	Frequency	Percent
Mobile payments	69	27.2%	Men	118	46.5%
Mobile remittance	66	26.0%	Women	136	53.5%
P2P lending	62	24.4%			
Crowdfunding	57	22.4%			
Total	254	100%	Total	254	100%
Age	Frequency	Percent	Education	Frequency	Percent
20–29	59	23.2%	Less than high school	1	0.4%
30–39	57	22.4%	High school	29	11.4%
40–49	73	28.7%	College/associate	40	15.7%
50 or older	65	25.6%	Bachelor	155	61.0%
			Master	25	9.8%
			PhD	4	1.6%
Total	254	100%	Total	254	100%
Use period	Frequency	Percent	frequency	Frequency	Percent
–3 months or less	89	35.0%	Several times a day	13	5.1%
–3 to 6 months	62	24.4%	Once a day	12	4.7%
–7 to 12 months	39	15.4%	Several times a week	44	17.3%
–13 to 18 months	9	3.5%	Once a week	22	8.7%
–19 to 24 months	23	9.1%	Once in several weeks	95	37.4%
–More than 24 months	32	12.6%	Once in several months	68	26.8%
Total	254	100%	Total	254	100%

good construct reliability. The average variance extracted (AVE) values of the eight measures were all greater than 0.5 (ranging from 0.715 to 0.838), supporting convergent validity. Table 2 presents the correlation coefficients of the eight research constructs. For all the constructs, the square roots of the AVE were greater than the correlations with the other constructs, indicating a satisfactory level of discriminant validity [31]. Thus, these validity tests confirmed that the research construct had convergent and discriminant validity. We also conducted Harman’s single-factor test to address common method variance (CMV) [94]. The single factor explained only 33.58% of the total variance, suggesting that common method bias is not a serious concern in this study.

4.4. Analytical approach: fsQCA

This study adopts a fsQCA to investigate the specific configurations of Fintech attributes that produce high Fintech use. fsQCA is a set-membership analytical technique suitable for complex configuration analyses [95]. It was originally developed for use in sociology and political science research, but it has recently been used to identify multiple construct configurations in the IS and innovation research fields [29,38,57,86,91].

The first step in fsQCA involves calibration, which allocates a set membership for all variables by transforming all causal conditions (the seven predictors) and the one outcome (i. Fintech use) into set membership values ranging from 0 (fully out of a set) to 1 (fully in a set) [30,95,127]. We used fsQCA version 4.0 software for this process to conduct the automatic calibration procedure and identify specific configurations [97]. To translate each variable’s raw data into fuzzy set membership values, we defined three anchors: full membership (fuzzy score = 0.95), cross-over point (fuzzy score = 0.50), and full non-membership (fuzzy score = 0.05) [30,97].

Because we used a seven-point Likert scale to assess our eight

Table 2
Reliability and correlations of variables.

Constructs	Cronbach's α	CR	AVE	1	2	3	4	5	6	7	8
1. Relative advantage	0.807	0.885	0.720	.849							
2. Meaningfulness	0.890	0.931	0.819	.669	.905						
3. Perceived risk	0.854	0.875	0.704	-.232	-.217	.839					
4. Structural assurance	0.804	0.883	0.715	.258	.273	.163	.846				
5. Trust in transactions	0.869	0.920	0.793	.318	.355	.051	.699	.891			
6. System quality	0.872	0.922	0.797	.562	.527	-.198	.161	.242	.893		
7. Information quality	0.903	0.939	0.838	.608	.646	-.144	.358	.461	.612	.915	
8. Fintech use	0.848	0.908	0.768	.526	.588	-.126	.451	.498	.395	.520	.876

Note: The italic numbers on the diagonal are the square roots of the average variance extracted shared between the constructs and their measures. Off-diagonal elements are the correlations among constructs.

constructs (seven predictors and one outcome), we set 6 as the anchor for full membership, 2 as the anchor for full non-membership, and 4 as the cross-over point when we transformed the variables into fuzzy set values, following the suggestions of previous fsQCA studies [30,87,91,122]. To test the validity of this calibration, we conducted multiple sensitivity analyses varying the anchor values (see Appendix C). Table 3 shows a summary of the statistics and their calibration values.

The second step is a truth table analysis identifying the configurations of causal conditions that sufficiently produce an outcome [30,95–97]. The analysis logically lists all possible causal combinations of the seven elements based on their calibrated set membership scores. Appendix D shows the truth tables for mobile payments and the other three Fintech types. Based on the calibration results, each case is allocated into one of several possible combinations that correspond to one row in the truth table. As we have seven elements, the truth table theoretically showed 128 (2^7) possible ideal combinations.¹ To identify the configurations that consistently produced the desired outcome, the truth table was assessed based on the frequency and consistency of each case [97].

First, we set the threshold to the minimum frequency. The “frequency” columns in the truth tables show the number of cases allocated to each row (i.e., the combinations). A frequency cutoff value is necessary to divide the configurations into relevant and irrelevant categories. This threshold is generally determined based on the sample size and researchers’ knowledge of cases. Extant QCA studies suggest that an appropriate cutoff value of 1 or 2 is suitable for small and medium-sized samples, and a cutoff value of at least 3 is recommended for large samples (e.g., 150 and more cases) [39]. As our mobile payments sample has 69 cases, we set the minimum acceptable cutoff value to 2, meaning that only combinations with at least two cases were considered for subsequent analysis in the truth table algorithm. The sample sizes for the other three Fintech types (mobile remittance, P2P lending, and crowdfunding) were 66, 62, and 57, respectively. As these are small and medium-sized, given the exploratory nature of this study, we set the overall acceptable frequency to 2 for high Fintech use (not-high Fintech use) across the four Fintech types [30].

We then determined the minimum acceptable consistency for high Fintech use (not-high Fintech use) according to the distributions of the observed consistencies in the truth table. The truth table algorithm calculates a consistency score that explains how reliably a combination results in the outcome. This measure is similar to the significance level in regression analysis. For high Fintech use, this study relied on both raw consistency and the PRI (proportional reduction in inconsistency) consistency in fsQCA.² We applied two rules to determine the cutoff for consistency based on the QCA literature [92,97]. First, a combination’s

raw consistency should be above 0.8 to result reliably in high Fintech use. Second, the PRI consistency cutoff should be above 0.5 for high Fintech use. Appendix D explains in detail how we set consistency cutoffs in the truth table analysis for each Fintech type.

The third step involves a counterfactual analysis to minimize the number of Fintech attributes in the truth table for the configurations and to find more parsimonious configurations that produce the outcome of interest. The truth table algorithm in fsQCA uses a counterfactual analysis to manage the rows without empirical cases (i.e., limited diversity) and to further minimize the number of causal conditions in a configuration [30]. Specifically, counterfactual analysis distinguishes between “easy” and “difficult” counterfactuals, leading to three types of sufficient solutions: a complex solution with no counterfactuals, an intermediate solution with “easy” counterfactuals, and a parsimonious solution with both “easy” and “difficult” counterfactuals. The truth table algorithm finds the most parsimonious solution in which all elements have a stronger causal relationship with the outcomes [30] and are thus core conditions for the outcome. In this study, we made no assumptions about directional relationships or “easy counterfactuals.” Thus, we do not get an intermediate solution. That is, complex solutions are identical to intermediate solutions. Therefore, causal conditions that appear in both complex and parsimonious solutions are referred to as “core,” and those that appear only in complex solutions are called “peripheral” [30] (see Appendix E). Through these three fsQCA steps, we identified causal condition configurations that produced the outcome by examining whether Fintech users who shared the same set of attributes from the three dimensions consistently exhibited high Fintech use. In this study, we created a set of configurations of high and not-high Fintech use for each Fintech type. After interpreting the analysis results and developing the final propositions, we conducted an applicability check to assess the relevance of our findings to Fintech practitioners. The applicability check is an exploratory approach to test whether our research model and its findings are feasible in practice. Appendix F describes how we conducted this check and presents the key findings. Next, we explain the key findings from our empirical results and suggest overarching theoretical propositions regarding the configurations for achieving high Fintech use.

5. fsQCA results

Figs. 3–6 represent the fsQCA results for the four Fintech types graphically. Each rectangle depicts one configuration. The black circles (●) correspond to the presence of a condition, and the crossed-out circles (⊗) refer to its absence [30]. The large circles represent the core elements of a configuration, and the small circles are peripheral elements. Blank spaces are a “do not care” condition in which the causal condition can be either present or absent. Core elements are regarded as having a strong causal condition with the outcome, whereas peripheral elements have a weaker causal condition [30]. Different configurations of core, peripheral, and neutral conditions are found, as shown in Figs. 3–6.

We employed two measures (consistency and coverage) to determine

¹ 2^k , k = the number of conditions.

² Raw consistency gives credit for “near misses” and penalties for large inconsistencies, whereas PRI consistency additionally eliminates the influence of cases with simultaneous membership in both the outcome and its complements (i.e., y and $\sim y$) [91,92].

Table 3
Descriptive statistics and their calibration values ($N = 254$).

Measure	Measure descriptions					Calibration values		
	Mean	Std. deviation	Minimum	Median	Maximum	Fully in	Cross-over	Fully out
Causal conditions								
Relative advantage	5.31	0.91	2.00	5.25	7.00	6	4	2
Meaningfulness	5.21	0.95	2.33	5.00	7.00	6	4	2
Perceived risk	3.85	1.04	1.00	4.00	6.50	6	4	2
Structural assurance	4.13	0.94	2.00	4.00	6.33	6	4	2
Trust in transactions	4.39	0.88	1.67	4.33	6.67	6	4	2
System quality	5.25	1.03	2.00	5.00	7.00	6	4	2
Information quality	4.98	0.90	2.33	5.00	7.00	6	4	2
Outcome								
Fintech use	4.65	0.92	2.25	4.50	7.00	6	4	2

	High use configurations		Not-high use configurations				
	H1a	H1b	L1	L2a	L2b	L3	L4
New service attributes							
Relative advantage	●	●	⊗	●	⊗	●	●
Meaningfulness	●	●	⊗	●	●	⊗	●
Perceived risk	⊗	●	⊗	⊗	⊗	⊗	⊗
Financial service attributes							
Structural assurance		●	⊗	⊗	●	⊗	⊗
Trust in transaction	●	●	⊗	⊗	●	●	⊗
IT attributes							
System quality	●	●	⊗	⊗	●	●	●
Info. quality	●	●	⊗	●	●	●	●
Consistency	0.836	0.867	0.992	0.955	0.953	0.961	0.861
Raw coverage	0.635	0.682	0.290	0.305	0.306	0.350	0.483
Unique coverage	0.075	0.121	0.051	0.016	0.023	0.028	0.107
Overall solution consistency	0.852		0.867				
Overall solution coverage	0.756		0.628				

Note: ● core presence, ⊗ core absence, ● peripheral presence, ⊗ peripheral absence.

Fig. 3. Configurations for high use vs. not-high use for mobile payments ($N = 69$).

	High use configuration			Not-high use configuration	
	H1a	H1b	H1c	L1a	L1b
New service attributes					
Relative advantage	●	●	●	●	●
Meaningfulness	●	●	●	⊗	⊗
Perceived risk	⊗	⊗	●	●	●
Financial service attributes					
Structural assurance	⊗	●	●	⊗	●
Trust in transaction		●	●	⊗	●
IT attributes					
System quality	●	●	●	●	●
Info. quality	●	●	●	●	●
Consistency	0.858	0.918	0.900	0.978	0.908
Raw coverage	0.493	0.637	0.706	0.350	0.321
Unique coverage	0.096	0.032	0.101	0.060	0.031
Overall solution consistency	0.863			0.921	
Overall solution coverage	0.834			0.381	

Fig. 4. Configurations for high use vs. not-high use for mobile remittance ($N = 66$).

each configuration's fit. Consistency describes the extent to which a configuration consistently leads to the outcome. A threshold of 0.75 indicates good consistency, suggesting that the configurational solutions reliably result in high performance [29,97]. Coverage refers to the extent to which high Fintech use can be explained by a configuration, in that greater coverage empirically implies more relevant and important configurations [29,97]. Coverage in the truth table is similar to an R^2 value in correlational methods [128]. Raw coverage indicates the proportion of memberships in the outcome explained by each term in the configuration, and unique coverage refers to the proportion explained by only one solution, excluding memberships covered by other solutions

[96]. The overall solution consistency indicates the degree to which all configurations together consistently result in high Fintech use (or not-high Fintech use), with an acceptable level of 0.75, while the overall solution coverage is the total coverage by all configurations together.

5.1. Configurations in mobile payments

Fig. 3 depicts the fsQCA results for mobile payments. Our analysis yields two configurations for high use and five for not-high use. Our results show an overall solution consistency of 0.852 for high mobile payment use, indicating that the two solutions explain a large portion of

	High use configuration		Not-high use configuration	
	H1a	H1b	L1a	L1b
New service attributes				
Relative advantage	●	●	⊗	⊗
Meaningfulness	●	●	⊗	⊗
Perceived risk	⊗	●	⊗	●
Financial service attributes				
Structural assurance		●	⊗	●
Trust in transaction	●	●	⊗	●
IT attributes				
System quality	●		⊗	⊗
Info. quality	●	●	⊗	●
Consistency	0.879	0.918	0.988	0.957
Raw coverage	0.513	0.615	0.329	0.398
Unique coverage	0.177	0.279	0.057	0.126
Overall solution consistency	0.886		0.962	
Overall solution coverage	0.792		0.455	

Fig. 5. Configurations for high use vs. not-high use for P2P lending ($N = 62$).

High use configuration						Not-high use configuration
	H1	H2	H3	H4	H5	
New service attributes						No configuration found
Relative advantage	⊗	●	⊗		●	
Meaningfulness		●	●	●	●	
Perceived risk	●		●	●	⊗	
Financial service attributes						
Structural assurance	●	●	●	●	⊗	
Trust in transaction	●	●	●	●	⊗	
IT attributes						
System quality	⊗	●		●	●	
Info. quality	●	●	●	●	●	
Consistency	0.934	0.918	0.950	0.925	0.873	
Raw coverage	0.392	0.632	0.411	0.497	0.436	
Unique coverage	0.028	0.096	0.001	0.001	0.072	
Overall solution consistency	0.866					
Overall solution coverage	0.770					

Fig. 6. Configurations for high use vs. not-high use for crowdfunding ($N = 57$).

the outcome. These solutions also accounted for 75.6% of high mobile payment use cases. In addition, we found an overall solution consistency of 0.867 for four solutions resulting in not-high use and an overall solution coverage of 0.628.

As all configurations for high use have the same core elements but different peripheral elements, we labeled them H1a and H1b [30,92]. In both H1a and H1b, a strong relative advantage, meaningfulness, and trust in transactions were essential for achieving high mobile payment use. System quality and information quality were peripheral conditions for high use, indicating that they may complement the three core conditions and work together to establish high use. Specifically, H1b contains six Fintech attributes regardless of perceived risk, showing the largest raw coverage (0.682) and unique coverage (0.121). This indicates that H1b is empirically the most relevant and important for high use; thus, it can be viewed as a general solution among the two configurations for achieving high use in mobile payments. The other solution (H1a) has a lower unique coverage of 0.075, meaning that it mostly overlaps with H1b and can be considered modified, as it is adjusted from H1b. That is, H1a may be a minor variation of H1b in its structure with the same core elements but different peripheral elements. When the perceived risk is absent ($\sim$ PR), H1a shows that structural assurance does not matter. Given the high consistency (0.836) of H1a, it can more effectively engender high mobile payment use than the general solution (H1b), as a general solution with high levels of all attributes may be unnecessary and wasteful.

Furthermore, we conducted a necessary condition test for five conditions (relative advantage, meaningfulness, trust in transactions,

system quality, and information quality) that are present in all configurations of high mobile payment use (see Appendix C). The results show that, except for trust in transactions, the consistencies of relative advantage and meaningfulness being necessary conditions for high use are above 0.9 (0.929 and 0.937, respectively), indicating that they may be significantly consistent necessary conditions for high mobile payment use [97]. Based on our tests, we conclude that relative advantage and meaningfulness are core and necessary conditions for achieving high mobile payment use. The results also show that the consistencies of system quality and information quality are greater than 0.9 (0.918 and 0.971, respectively), as strong IT is critical for high mobile payment use. Other Fintech attributes (perceived risk, structural assurance, and trust in transactions) have consistencies below 0.9, demonstrating that none are necessary conditions for high use.

We found five configurations for not-high mobile payment use. As two of the five configurations have the same core elements but different peripheral elements, we labeled the five configurations as L1, L2a, L2b, L3, and L4. The results show that the core elements, the absence of relative advantage ($\sim$ RA), meaningfulness ($\sim$ MF), and trust in transactions ($\sim$ TRU), can lead to not-high mobile payment use. Interestingly, the results demonstrate that IT attributes such as system quality and information quality are peripheral elements for the three configurations for not-high use (L2b, L3, and L4), indicating that IT alone cannot guarantee high use, although they are necessary conditions for high mobile payment use. Moreover, we found that the absence of perceived risk is present in all five configurations for not-high use. Given that the absence of perceived risk is also a peripheral condition for high use, this

absence of perceived risk cannot be a driving factor for high mobile payment use without being combined with other conditions. Thus, Fintech companies offering mobile payments must focus on how they deliver conditions differently, combined with the absence of perceived risk, to achieve high use. Overall, we observed that the simultaneous presence of relative advantage, meaningfulness, and trust in transactions are essential for inducing high use, and the absence of any of these three conditions reduces this use. Therefore, to achieve high mobile payment use, Fintech companies should ensure that all three of these elements are provided.

5.2. Configurations in mobile remittance

We found three configurations for high mobile remittance use (H1a, H1b, and H1c) and two configurations for not-high use (L1a and L1b), as shown in Fig. 4. Overall solution consistency and coverage displayed 0.863 and 0.834 for high use and 0.921 and 0.381 for not-high use, respectively, indicating that they explain the outcomes for high use and not-high use to a large extent.

Our results reveal that the presence of meaningfulness is a core element in creating the three high-use configurations (H1a, H1b, and H1c). Relative advantage and information quality are peripheral conditions for these three configurations. In particular, H1c includes six Fintech attributes regardless of perceived risk and shows the largest raw and unique coverages (0.706 and 0.101), indicating it is the most relevant and important configuration for high mobile remittance use. Thus, H1c is considered a general solution for mobile payments, like H1b. In addition, similar to mobile payments, mobile remittance users consider the absence of perceived risk as fundamental for high mobile remittance use. When the perceived risk is suppressed ($\sim$ PR), H1a shows that system quality is present, structural assurance is absent ($\sim$ SA), and trust in transactions does not matter. In contrast, H1b demonstrates that structural assurance and trust in transactions are present, but system quality does not matter when there is no perceived risk. That is, when system quality exists, users do not require structural assurance and trust in transactions, but when structural assurance and trust in transactions occur, they do not need system quality. Aside from the general solution (H1c), H1b, with the highest consistency (0.918), is empirically the most effective in achieving high mobile remittance use when perceived risk is suppressed.

Moreover, we tested the necessary conditions for relative advantage, meaningfulness, and information quality, as they are present in all three high-use configurations. The results show that the consistency measures of relative advantage and meaningfulness are above 0.9 (0.969 and 0.946, respectively), indicating that they may be significantly consistent necessary conditions for high use. The consistency scores for system quality and information quality, as well as trust in transactions, are also greater than 0.9 (0.916, 0.964, and 0.905, respectively). As a result, meaningfulness is a core and necessary condition for high mobile remittance use, and relative advantage and information quality are peripheral and necessary conditions for high use. Other Fintech attributes (perceived risk and structural assurance) have a consistency lower than 0.9, meaning that they are not necessary conditions for high use.

We found two configurations for not-high use. First, the absence of meaningfulness ($\sim$ MF) is a core condition for not-high use when perceived risk exists. In particular, the absence of meaningfulness and the presence of perceived risk are essential to produce not-high mobile remittance use, indicating that users do not use mobile remittance when the services do not meet their needs and fail to provide a secure and reliable money transfer process. Moreover, system and information quality remain in all configurations for not-high use, indicating that IT does not guarantee high mobile remittance use. Overall, the presence or absence of meaningfulness and perceived risk can be critical to high and not-high use; thus, Fintech companies should carefully manage these two conditions to achieve high mobile remittance use.

5.3. P2P lending configurations

For P2P lending, we observed two configurations for high use (H1a and H1b) and two for not-high use (L1a and L1b; see Fig. 5). High use presents an overall solution consistency of 0.886 and an overall solution coverage of 0.792, while not-high use results in 0.962 and 0.455, respectively.

Strong relative advantage and meaningfulness, supported by trust in transactions and information quality, are essential for high P2P lending. Interestingly, two configurations (H1a and H1b) show different results depending on the presence or absence of perceived risk. H1a includes system quality as a peripheral element without perceived risk ($\sim$ PR), whereas H1b shows structural assurance as a peripheral element with perceived risk. That is, users who perceive P2P lending as trustworthy tend to require strong system quality to generate high use (H1a). In contrast, users who perceive P2P lending as risky need structural assurance to achieve high P2P lending use (H1b). Between the two configurations, H1b has greater raw/unique coverage and consistency (0.615, 0.279, and 0.918) than H1a (0.513, 0.177, and 0.879), indicating that H1b is the more relevant and important configuration and is effective for high P2P lending. This shows that for P2P lending, even if perceived as risky, high use can be achieved with sufficient institutional assurance and guarantees.

A necessary condition test is required, as relative advantage, meaningfulness, trust in transactions, and information quality are shown in all configurations for high use. The results show that relative advantage, meaningfulness, and information quality are above 0.9 (0.932, 0.918, and 0.971, respectively), and trust in transactions is slightly below 0.9 (0.897), indicating that they are all necessary conditions for high P2P lending use. However, structural assurance is lower than 0.9 (0.852), and system quality is slightly higher than 0.9 (0.905), meaning that structural assurance is unnecessary for high P2P lending use, while system quality is necessary.

Furthermore, we found two configurations for not-high use in P2P lending (L1a and L1b). Between the two configurations, the absence of relative advantage ($\sim$ RA) and meaningfulness ($\sim$ MF) are core conditions in all configurations for not-high use. All seven Fintech attributes are absent in L1a, while L1b includes the presence of four attributes (perceived risk, structural assurance, trust in transaction, and information quality) and the absence of system quality ($\sim$ STQ) as peripheral elements. This implies that the absence of two core elements (relative advantage and meaningfulness) is essential for not-high use regardless of the presence of other attributes.

5.4. Crowdfunding configurations

Regarding crowdfunding, we found five configurations for high use (H1, H2, H3, H4, and H5) and no configurations for not-high use, as shown in Fig. 6. The high use of crowdfunding presented an overall solution consistency of 0.866 and a solution coverage of 0.770, which are above the acceptable level. Unlike the configurations of the three Fintech types, the results indicate no core element, only showing present, absent, or blank. The presence of structural assurance, trust in transactions, and information quality are important for high crowdfunding use despite their not being core elements. Among the five configurations, H2 is regarded as a general solution comprising six attributes regardless of perceived risk, with the highest raw/unique coverage for high use (0.632 and 0.096). Additionally, H1, H3, and H4 show different configurations for high use with perceived risk, while only H5 is a configuration for high use without perceived risk ($\sim$ PR). These results reveal that although most users perceive crowdfunding as risky, they will engage in high use depending on how other attributes are conveyed. For example, in the presence of perceived risk, high crowdfunding use can be achieved with structural assurance and trust in transactions, accompanied by either information quality (H1), meaningfulness and information quality (H3), or meaningfulness, system

quality, and information quality (H4). That is, when structural assurance and trust in transactions are supported by information quality, crowdfunding users are more willing to use the service despite the presence of perceived risk.

On the other hand, users who perceive crowdfunding as safe and trustworthy can achieve high use (H5) with relative advantages and meaningfulness, supported by system quality and information quality, despite the lack of structural assurance and trust in transactions. However, four of five configurations include structural assurance and trust in transactions, indicating that most users view crowdfunding as risky and require institutional- and process-based trust. Among the configurations, given that the consistency of H3 is greater than other configurations (0.950), it is more effective in producing high crowdfunding use when strong structural assurance and trust in transactions are emphasized, accompanied by meaningfulness and information quality.

In addition, we conducted a necessary condition test on information quality, as it is present in all high crowdfunding use configurations. As shown in Table C of Appendix C, the consistency score of information quality is greater than 0.9 (0.964), and that of meaningfulness is slightly below 0.9 (0.898), indicating that they are the only necessary conditions for high crowdfunding. However, the consistency scores of structural assurance and trust in transactions are lower than 0.9 (0.768 and 0.841, respectively), suggesting that they are not necessary conditions for achieving high crowdfunding use.

6. Discussion and implications

6.1. Discussion of findings

Based on a holistic and configurational approach, this study proposed a theoretical Fintech framework with three dimensions (innovation, financial services, and IT) and aimed to determine whether the complex and nonlinear interaction and interdependency among the attributes of these dimensions can produce specific outcomes (high use and not-high use). For this purpose, we identified seven key attributes within the three Fintech dimensions. Then we conducted an empirical analysis to investigate specific configurations that produce high use or not-high use. To conceptually explain our findings and develop a context-specific middle-range theory, we divided Fintech into four types: mobile payments, mobile remittance, P2P lending, and crowdfunding, which are representative Fintech services. Across these four types, we validated conjunctural and equifinal causation among the attributes and asymmetric causation in that the structures of configurations for high use differ from those of not-high use. Our findings show the interdependency among Fintech attributes that achieve high or not-high use across the four Fintech types. This study highlights the importance of attribute configurations rather than individual attributes to better understand each attribute's role regarding the four Fintech types. The specific configurations of these attributes can provide a

competitive advantage for Fintech companies as the delivery of specific configurations to users can be difficult for other companies to imitate, leading to high performance.

Fig. 7 summarizes our empirical findings for high use across the four Fintech types. As shown in Fig. 7, we found a common general solution for three Fintech types (excluding P2P lending). A general solution refers to the same structure, comprising different configurations of the same six attributes, that can lead to high Fintech use (H1b for mobile payments, H1c for mobile remittance, and H2 for crowdfunding). For most Fintech types, it is unsurprising that users prefer a high-quality solution with high levels of all Fintech attributes and no perceived risk. However, from the point of view of Fintech companies, offering users a general solution with a high level of all attributes might be unnecessary and wasteful. Therefore, Fintech companies may look for alternative solutions to achieve high use. In this study, we attempted to investigate how to achieve high Fintech use effectively by differently configuring the emphasis of Fintech attributes in their pathways. Based on our empirical findings, we suggest the following six theoretical propositions.

For each Fintech type, we found specific configurations to achieve high use. For example, relative advantage, meaningfulness, and trust in transactions are essential to induce high use of mobile payments, while meaningfulness is critical to generating high mobile remittance use. For both mobile payments and remittances, the absence of perceived risk and strong IT should be supported as peripheral conditions for high use. However, relative advantage and meaningfulness are key to generating high P2P lending use, whereas structural assurance and trust in transactions are essential to engender high crowdfunding use. Interestingly, in contrast to mobile payments and remittances, the absence of perceived risk and strong IT are unnecessary to achieve high use of P2P lending and crowdfunding. For P2P lending, structural assurance and system quality have a trade-off relationship depending on the presence of perceived risk. In the absence of perceived risk, a configuration with system quality does not include structural assurance, and vice versa, and a configuration with structural assurance excludes system quality when perceived risk is present. For crowdfunding, most high-use configurations include perceived risk, indicating that users perceive crowdfunding as intrinsically risky and may be willing to use it depending on how other conditions combine with perceived risk. Structural assurance and trust in transactions, supported by information quality, are dominant for achieving high crowdfunding use. However, the other attributes do not significantly induce high use of crowdfunding. Overall, Fintech companies must know which attributes are important across Fintech types to develop their market strategies. They must consider how users value service attributes within the configurations to achieve high use. Based on these insights, we suggest the following:

Proposition 1: To achieve high Fintech use, the seven Fintech attributes should be configured with different emphases according to Fintech type. Therefore, companies should carefully consider how to emphasize these configurations differently to achieve high Fintech use across

	Mobile payment		Mobile Remittance			P2P lending		Crowdfunding				
	H1a	H1b	H1a	H1b	H1c	H1a	H1b	H1	H2	H3	H4	H5
Relative advantage	●	●	●	●	●	●	●	⊗	●	⊗	●	●
Meaningfulness	●	●	●	●	●	●	●	●	●	●	●	●
Perceived risk	⊗	●	⊗	⊗	●	⊗	●	●	●	●	●	⊗
Structural assurance	●	●	⊗	●	●	●	●	●	●	●	●	⊗
Trust in transaction	●	●	●	●	●	●	●	●	●	●	●	⊗
System quality	●	●	●	●	●	●	●	⊗	●	●	●	●
Info. quality	●	●	●	●	●	●	●	●	●	●	●	●

Fig. 7. Summary of results: Configuration solutions for high use across the four Fintech types.

Fintech types.

Although previous studies have highlighted the key role of IT in Fintech, few have examined empirically how it affects Fintech use. Furthermore, while Fintech is intertwined with finance, IT, and other factors, little research exists on how companies can emphasize IT differently when developing services to increase Fintech use. Therefore, in this study, we examined the role of IT in configurations to achieve high Fintech use. As shown in Fig. 7, we found that system quality and information quality as IT attributes are present in most configurations across the four Fintech types, implying that IT is critical for achieving high use. In particular, information quality is more critical than system quality, and system quality is often traded for structural assurance depending on the level of perceived risk.

In addition, we found a multifaceted role of IT across Fintech types, which have different pathways to high use. For example, high system quality and information quality are both necessary for increasing the use of mobile payment and mobile remittance, while they are not all necessary for the high use of P2P lending and crowdfunding. That is, IT is vital in mobile payment and mobile remittance, while it plays an enabling role in P2P lending and crowdfunding. Although IT is critical for generating high use, it is also present in configurations for not-high use. For example, system quality and information quality are necessary conditions for generating high use but are also present in all not-high-use configurations for mobile remittance, demonstrating that IT can play a counterproductive role. That is, IT has multifaceted roles across Fintech types, such as core, enabling, or counterproductive, meaning that users will not engage with Fintech solely because IT capabilities are robust. Therefore, a key to increasing its use is configuring it with other attributes across Fintech types, exemplifying conjunctural causality. For example, in crowdfunding, a configuration with structural assurance and trust in transactions requires less critical IT to achieve high use. Park and Mithas [92] indicated that despite IT's importance, its presence alone in any of their configurations was neither necessary nor sufficient for high performance. Our results are consistent with previous studies showing that system quality and information quality play multifaceted roles in combination with other attributes, depending on the context. Therefore, Fintech companies should focus on developing high-quality IT that users will recognize, but it must be combined with other Fintech attributes and delivered to users differently depending on the Fintech type. Therefore, we suggest the following:

Proposition 2: For all Fintech types, system quality and information quality play multifaceted roles (core, enabling, or counterproductive), depending on how they are combined with other Fintech attributes. Therefore, harmonizing IT with other attributes is key to achieving high Fintech use.

The mobile payment method was the first Fintech function introduced to the market. This method simplifies the inconvenient and complicated process of traditional online payments and provides fast and convenient services anytime and anywhere [32]. Mobile payment users prioritize efficient utilization, such as easy access, ease of use, and fast and seamless payments. However, there are also security and privacy concerns, as wireless networks are more vulnerable to hackers and information interception, and mobile encryption systems are not as robust as online encryption systems [32,138].

Regarding mobile payments, we found that relative advantages and meaningfulness based on trust in transactions are core elements in all configurations for high use. To achieve high use, these core conditions should be complemented by system quality and information quality when perceived risk is suppressed. This presents the question of why mobile payment users consider strong relative advantages, meaningfulness, and trust in transactions critical for high use. A plausible reason could be that the key to mobile payment success is to provide new and superior services to users that overcome the limitations of traditional online payments, which ultimately satisfies users' needs. However, relative advantages and meaningfulness alone cannot motivate mobile payment users to use a service; thus, to achieve high use, they should be

supported by other Fintech attributes.

As shown in Fig. 7, the effective pathway for mobile payments (H1a) shows that relative advantages and meaningfulness complemented by strong system quality and information quality can achieve high use when perceived risk is suppressed. This indicates that users regard strong IT as a necessary element for high mobile payment use, which enables easier, faster, and more convenient services than traditional payment services, helping users trust payment transactions [52,105]. Strong IT can also minimize perceived risk through new authentication technologies, which can alleviate users' security and privacy concerns, increase trust in mobile payment services, and ultimately satisfy user needs. Given that strong IT can reduce uncertainty and increase trust in payment transactions, users may choose to use mobile payments due to new service attributes (relative advantages and meaningfulness) regardless of structural assurance. To meet users' practical needs and induce high mobile payment use effectively, Fintech companies should provide significant relative advantages, meaningfulness, and trust in transactions, supported by strong system and information quality. Based on these findings, we suggest the following:

Proposition 3: Relative advantages, meaningfulness, and trust in transactions should be central in configurations where perceived risk is suppressed to achieve high mobile payment use. These configurations can be more effective in achieving high use when system quality and information quality are supported.

Mobile remittance simplifies the remittance process by replacing traditional online IDs, passwords, certificates, or secret card authentication procedures with fingerprint recognition or a pre-registered user password [49,129]. Through mobile money transfer, users can easily and quickly send small amounts of money to friends and family with minimal or no fees. Due to this efficient process, mobile remittance is often used as a prepaid payment method, where individuals send money to directly pay for goods and services. However, mobile remittance users' main concerns are that the simplified process and authentication could lead to user mistakes, such as sending money to the wrong bank account or sending money anonymously to a third party to be used for money laundering [73].

The mobile remittance results suggest that meaningfulness is essential as a core condition for high use. This should be complemented by relative advantages and information quality as peripheral conditions while suppressing perceived risk. This indicates that mobile remittance users consider meaningfulness an important measure for facilitating high use, as it meets their needs for easier and faster money transfers. That is, users focus on whether this service is effective by providing better functionality than existing services. They believe an efficient and streamlined remittance process that leverages IT can drastically reduce remittance operations and time, which may induce high mobile remittance use. Most importantly, like mobile payment users, mobile remittance users tend to be convinced that this method is safe and secure. Therefore, the absence of perceived risk is necessary to achieve high use of mobile devices for sending and receiving money. Users engender high use when innovative technologies, such as fingerprint recognition and pre-registered user passwords, help them feel secure and develop their trust.

Interestingly, we found two types of users for high use (H1a and H1b) with contrasting behavior patterns. When both system quality and information quality are present, structural assurance and trust in transactions are unnecessary (H1a), whereas they should be present when system quality is absent (H1b). A reason for the contrasting behavior patterns seems to be a difference in the degree of user trust in the institutions and the transaction. Users included in H1a perceive the mobile remittance money transfer process as trustworthy, so they require less or no structural assurance and trust in transactions [79,129]. On the other hand, for H1b, users do not trust the mobile remittance process and still perceive it as risky, so they require strong institutional assurances and trust in transactions rather than robust technological systems for high use. Therefore, while perceived risk is suppressed, Fintech companies

should focus on meaningfulness with relative advantages, supported by system quality and information quality or structural assurance and trust in transactions according to user tendency. Therefore, we suggest the following:

Proposition 4: To achieve high mobile remittance use, strong meaningfulness complemented by relative advantages and information quality should be critical in configurations where perceived risk is suppressed. These configurations can be more effective in achieving high use when system quality is present or structural assurance and trust in transactions are present according to user tendency.

As P2P lending provides its services entirely online, it has efficient working mechanisms to offer investors or borrowers more financial benefits (i.e., lower lending rates and higher returns on investments) than traditional financial institutions. Due to its efficient work process, most P2P lending platforms charge very little or even nothing for loan transactions [70]. Moreover, P2P lending can provide microfinancing or small loans online without going through traditional financial intermediaries [10,123]. However, the risk of loan default and the borrowers' falsified loan information remain the main user concerns in P2P lending.

Our results show that strong relative advantage and meaningfulness play dominant roles in all high-use configurations. These configurations must be supported by trust in transactions and information quality. P2P users, like other Fintech users, highly value new and innovative financial services that do not exist in traditional financial services, such as low fees, access to small loans online, and microfinancing. In addition, information asymmetry, a major user concern, can be addressed when trust between lenders and borrowers is established. To reduce the information asymmetry between investors and borrowers, the first step is to assure P2P lending users trust that their transactions are secure. Thus, trust in transactions is also necessary for increasing P2P lending.

In P2P lending, we found that there are two types of users (H1a and H1b), depending on the risk perception. The first user type (H1a) believes that strong IT can enable trustworthy transactions, making P2P lending less risky. They feel that IT enables a simple and effective lending process, such as providing recommendation systems and implementing big data analysis based on machine learning technologies that assess borrowers' credit or loan risk. Furthermore, innovative IT enables additional work processes for loan transactions, such as funding and repayment monitoring processes, which reduce information asymmetry and improve trust in transactions. Hence, users are likely to engage in P2P lending if it provides efficient and secure work processes for lending transactions supported by IT, making it less risky.

However, the other user type (H1b) does not trust IT and perceives P2P lending as risky. Thus, they believe that strong institutional assurance must be provided to generate high use. Furthermore, they tend to strongly rely on institutional-based trust to alleviate financial loss concerns. For example, P2P lending can build user trust by providing compensation policies, credit risk assessments, investor protection funds, and automated monitoring and auditing [107]. That is, in a low-risk environment (in the absence of perceived risk), system quality and information quality are required as peripheral elements to achieve high use. However, in a high-risk environment (in the presence of perceived risk), the support of structural assurance is critical to achieve high use. Therefore, P2P lending companies must develop an effective market strategy that closely aligns with users' IT and risk perceptions while providing trust transactions based on high-quality information. Hence, we suggest

Proposition 5: To achieve high P2P lending use, strong relative advantages and meaningfulness complemented by trust in transactions and information quality should play dominant roles in configurations. These configurations can be more effective in achieving high use when system quality is present without perceived risk or structural assurance is present with perceived risk.

Crowdfunding is a form of alternative financing performed entirely online [113,134]. From the perspective of borrowing money or

financing motives, crowdfunding is a special form of P2P lending [64]. Unlike P2P lending used for gaining financial rewards, crowdfunding users or backers often contribute money either as a donation or in exchange for non-financial rewards. However, potential backers as crowdfunding users are deterred from pledging due to the low success rate of projects, the fear of falling victim to fraud, and the lack of institutional protection against it [64,70,110,113]. This is because users may distrust creators and crowdfunding platforms. In particular, trust in a crowdfunding platform is critical to increasing use; however, this can be difficult to achieve as its creators are not fully known [113]. Therefore, users should pay attention to the institutional protection mechanisms provided by a crowdfunding platform in case of project failure, and how it can help reduce failure rates.

In crowdfunding, two user groups are found depending on risk perceptions. For users who view crowdfunding as risky (H1, H3, and H4), strong structural assurance and trust in transactions are important in all high-use configurations, accompanied by meaningfulness and information quality. Crowdfunding users' perceptions of structural assurance and trust in transactions as critical to high use may be because they rely heavily on institutional- and process-based trust to alleviate their unease regarding project failures or fraud on crowdfunding platforms. Thus, users are likely to trust the unknown creators of a crowdfunding platform when their beliefs are congruent with the platform's values, and they strongly trust the institutional structures and processes. Therefore, crowdfunding platforms must increase users' trust by providing various institutional protection mechanisms, such as credible rule-enforcement, authorization, fundraising, investment limits, disclosure obligations, monitoring, insurance, guarantees, and escrow services (protection of backer funds) [2,8].

On the other hand, the small proportion of users who trust crowdfunding and believe it to be safe require relative advantages and meaningfulness, supported by system quality and information quality, for high use. For this group, structural assurance and trust in transactions are not necessary, while strong system quality and information quality are critical as they can lead to high user trust and better quality crowdfunding. For example, creators' credit rating systems based on big data analytics are an example of strong IT. They can provide creator information and thus match creators and backers appropriately. In addition, transaction monitoring systems can help users develop trust in projects, thereby mitigating risk perceptions and making crowdfunding more trustworthy, achieving the high use without the presence of structural assurance and trust in transactions.

Therefore, crowdfunding users can achieve high use effectively if companies prioritize strong structural assurance and trust in transactions, complemented by high levels of meaningfulness and information quality, despite the presence of perceived risk. Moreover, users who do not perceive crowdfunding as risky can achieve high use even without structural assurance and trust in transactions if companies provide strong system and information quality. Given its relatively high risk than the other Fintech types, crowdfunding platforms should prioritize and carefully develop differentiated business strategies based on institutional assurance and high-quality IT to achieve high use. More formally, we suggest

Proposition 6: To achieve high crowdfunding use, strong structural assurance and trust in transactions should be essential in configurations. These configurations can be more effective in achieving high use when structural assurance and trust in transactions, supported by information quality, are provided in the presence of perceived risk, or when strong system quality and information quality are present without perceived risk.

6.2. Theoretical and practical implications

This study has several theoretical implications for researchers. First, we provide a deeper understanding of Fintech research based on a holistic and configurational approach. Previous IS research has mainly

considered the adoption and use of new digital services as the outcome of numerous isolated variables. However, such a traditional causal analysis limits the understanding of fusion phenomena, such as the interdependent multidimensional characteristics of Fintech use. That is, there has been a lack of practical methods for ensuring a realistic investigation of Fintech use by studying detailed dynamics in its configurations. Therefore, we adopted a holistic approach that has received significant attention in the management and innovation literature but only minimal attention in the IS literature. We believe the complexity view enabled by the configurational approach adopted in this study opens a new frontier for researching Fintech.

Second, we clarified the definition of Fintech by identifying three key dimensions. Then we designed a theoretical framework that embraces the multidimensional characteristics of Fintech. As the Fintech phenomenon is relatively new, and previous research has focused on the effects of individual antecedents, no theoretical framework embraces this multidimensional concept. Thus, our theoretical framework provides the boundary and scope of the research through a well-organized theoretical foundation. Therefore, the Fintech dimensions we have identified and the theoretical framework we have constructed will provide an essential theoretical base for future Fintech studies.

Third, this study advances the IS literature by explaining the detailed interdependencies among Fintech attributes and their combined effects on its use. To identify the interdependent and interrelated relationships in the Fintech context, we have proposed a theoretical framework combining three Fintech dimensions, each of which is composed of attributes. We then examined the interdependencies among these attributes to test their influence on Fintech use. Our study makes a significant research contribution by theoretically and empirically examining different combinations of Fintech attributes and exploring the relationships between specific attribute combinations and Fintech use. For example, based on DOI theory and the ISS model, we suggest that the role of each innovation attribute can differ in the presence or absence of other relevant attributes and should be considered together with a set of other attributes to understand their effects on the high use or not-high use of Fintech services. This may help enhance the understanding of the different rates of innovation adoption and continuous use or discontinuous use behavior after an innovation is adopted. More specifically, as our respondents are actually using Fintech services, they are either in the implementation or confirmation stage, which are the last two stages of innovation diffusion suggested in DOI theory (the first three stages—knowledge, persuasion, and decision—do not involve behavior and instead comprise mental exercises for decisions). High use may be related to the reinforcement status of the confirmation stage, and not-high use may be linked to the failure to resolve dissonance at the dissonance status of the confirmation stage. Therefore, by connecting the DOI theory and the configuration approach, our findings suggest how the specific attribute combinations reinforce behaviors or fail to reconcile dissonance regarding Fintech use, thus providing theoretical and empirical contributions.

Fourth, we attempted to study user behavior in the Fintech context using fsQCA. fsQCA in the IS field has often been used at the organizational level to identify different configurations of constructs, but rarely at the individual level [29,38,57,86,91]. Because qualitative comparative analysis can also capture the complexity of user decisions about technology use [29], we employed fsQCA to examine user decisions regarding Fintech use in this study. This study is an early attempt to investigate individual-level user behavior in the IS field by conducting a configuration analysis.

This study also has several practical implications. First, it can help Fintech managers establish multiple effective pathways to strengthen its use. Our results suggest that certain combinations produce high use and not-high use. In particular, knowing which combinations of Fintech attributes strengthen use behavior can help managers develop more effective personalized strategies to ensure the long-term survival of their companies. Furthermore, the solutions identified in this study reflect

users' perceptions of Fintech use across different Fintech types, providing practical implications for advanced user profiling. Using our findings, Fintech managers can develop new services and launch strategies for potential and existing users that take advantage of the combinations of Fintech attributes, leading to stronger performance.

Second, this study provides insights into the multifaceted role of IT in high Fintech use. As mentioned, IT has been known as a key factor in Fintech business success. Thus, we investigated IT's role in Fintech using fsQCA and found that IT is necessary for all solutions for both high use and not-high use. However, our results also show that IT alone does not achieve high use; it should consistently interact with other main attributes to increase use. This study is one of the earliest attempts to empirically identify the critical role of IT in increasing Fintech use. It shows that Fintech companies must have more than high-quality IT to develop their services.

Third, this study offers Fintech managers a new approach to improving their service development process. No individual service attribute alone can generate the "best" profile in the market due to the experiential nature and complexity of new services [87]. Because developing skills in all attributes might be inefficient, more effective methods should be created to increase Fintech use among different users. By implementing fsQCA, Fintech managers can develop alternative paths or strategies that combine individual attributes to strengthen Fintech use. Our holistic approach shows that more than one potentially successful combination can be developed, which could reduce the uncertainties and risks of developing a new service in the early stage [87].

6.3. Limitations and future research directions

Despite these contributions, this study also has several limitations. First, although fsQCA is suitable for investigating the causal complexity of Fintech use, its calibration can be biased due to researcher subjectivity. We conducted sensitivity analyses to evaluate whether our findings were robust to the use of a different calibration [91] (Appendix C). The results showed that our test remained valid, and concerns for calibration bias seem minimal.

Second, our findings might be difficult to generalize because adding or removing conditions can significantly alter the configurations in fsQCA [87]. Although we comprehensively developed seven attributes in three Fintech dimensions and identified solutions for high use and not-high use across Fintech types, some other attributes can also influence high Fintech use. Therefore, future research may further investigate other influential and significant Fintech attributes (e.g., complexity, self-efficacy, perceived cost, and service quality) and then evaluate the effects of their specific combinations on high use. Examining user factors can add useful knowledge on the high use or not-high use of Fintech. For example, a certain configuration consisting of user factors such as IT education, experiences with traditional financial services, disposition to innovation, and socioeconomic status may lead to high or not-high use.

Third, this study used 0.8 for raw consistency and 0.5 for PRI consistency, although Ragin [97] recommended 0.8 and 0.75, respectively. Determining the best cutoff for consistency is ultimately associated with identifying meaningful configurations and is highly dependent on the contextual knowledge of the researcher [92]. While the recommended values are ideal, many studies accept the lower value [92] or use a minimum threshold of 0.5 [89,117]. Given that we used a sufficiently high criterion for raw consistency and considered PRI consistency as an additional criterion, the limitations of our results are minimal. However, determining the optimal cutoff value remains challenging for fsQCA researchers. Thus, future studies should strike a balance between contextual knowledge and ideal criteria in fsQCA.

Fourth, this study investigated combinations of causal variables for Fintech innovation but did not identify the causality among those variables. For example, the various roles of IT as a trigger, enabler, and true innovator have been debated in the IS literature. However, we

concentrated on simultaneous and systematic combinations of Fintech attributes, including IT, without explaining the causal relationships between IT and other attributes. Thus, substantial empirical studies on the causal links among these attributes can be of interest to future research. Fifth, this study did not explore the theoretical meaning of specific configurations, as we focused on identifying configurations for high use across Fintech types empirically. Therefore, we suggest that future theoretical studies may go further to strengthen the findings of our study.

Finally, applying our findings to the global Fintech context should be done with caution, as our sample may reflect the national characteristics of South Korea. For example, some Fintech has been developed to extend financial services to certain communities in developing countries, known as unbanked or underbanked, which is different in terms of the environment and users of our study. Thus, future studies should investigate Fintech user behavior considering different national characteristics at the individual level.

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Appendix A. Structure of the survey instruments

Constructs	Questionnaire	Reference
Relative Advantage (RA)	RA1. Fintech is simpler and more convenient than traditional financial services. RA2. Unlike traditional financial services, fintech can be accessed anytime and anywhere. RA3 Fintech provides superior outcomes to traditional financial services.	Calantone et al. [13], Ordanini et al. [87]
Meaningfulness (MF)	MF1. Fintech is suitable for my needs. MF2. Fintech is useful. MF3. Fintech is worthwhile for me.	Cooper and Kleinschmidt [17], Im and Workman [48], Ordanini et al. [87],
Perceived Risk (PR)	PR1. Fintech lacks adoption or use in commerce. PR2 Fintech lacks interoperability with other services. PR3. Fintech has legal uncertainty.	Kim et al. [53], Benlian and Hess [9]
Structural Assurance (SA)	SA1. Considering the operational capability of Fintech companies, my transaction data and personal information are safe and secure. SA2. Considering the laws governing Fintech companies, my transaction data and personal information are safe and secure. SA3. Considering the customer protection policies of fintech companies, my transaction data and personal information are safe and secure.	Kim et al. [54], Mcknight et al. [75] Zhou [136], Yu et al. [133]
Trust in Transactions (TRU)	TRU1. Fintech provides high data integrity. TRU2. Fintech is reliable. TRU3. Fintech companies constantly provide reliable transactions.	Mcknight et al. [75], Zhou [138], Yu et al. [133]
System Quality (STQ)	STQ1. Fintech systems are easy to use. STQ2. Fintech systems can be accessed immediately. STQ3. Fintech systems enable me to accomplish my financial transactions.	Delone and McLean [23], Wang [124], Zhou [138]
Information Quality (IFQ)	IFQ1. The information provided by Fintech is easy to understand. IFQ2. The information provided by Fintech meets my needs. IFQ3. The information provided by Fintech is sufficient for my transactions.	Delone and McLean [23], Wang [124], Zhou [138]
Fintech Use (FU)	FU1. I often use Fintech. FU2. I currently use Fintech as a main means to use financial services. FU3. I mainly use Fintech for daily financial activities.	Lee [63], Ryu [100]

Appendix B. Variables’ factor loading and cross-loading scores

	1	2	3	4	5	6	7	8
Relative Advantage (RA)	.765 .794 .769	.214 .223 .244	-.173 -.072 -.024	.026 .102 .103	-.202 -.035 .257	.298 .391 .212	.059 .051 .167	.188 .187 .159
Meaningfulness (MF)	.251 .265 .151	.789 .797 .796	-.075 -.087 -.086	.212 .093 .174	.081 -.030 -.041	.301 .266 .268	.131 .122 .240	.282 .204 .240
Perceived Risk (PR)	-.094 -.035 -.053	-.101 .006 -.066	.841 .892 .877	.143 .104 -.082	.160 .024 -.160	-.088 -.067 -.052	-.037 -.157 .131	.016 -.007 -.017
Structural Assurance (SA)	-.027 .111 -.027	.253 .065 .253	-.018 .067 -.018	.764 .773 .764	.085 .256 .085	.103 .151 .103	-.145 -.038 -.145	.218 .121 .218
Trust in Transactions (TRU)	.021	.138	.051	-.343	.762	.162	-.016	.207

(continued on next page)

CRediT authorship contribution statement

Hyun-Sun Ryu: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Jinyoung Min:** Writing – review & editing, Writing – original draft, Visualization, Conceptualization.

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.

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(continued)

	1	2	3	4	5	6	7	8
	.179	-.009	-.040	-.171	.783	.099	.349	.121
	.082	.118	.007	-.158	.832	.026	.269	.177
System Quality (STQ)	.145	.142	-.147	.087	-.082	.867	.055	.140
	.235	.213	-.064	.036	-.026	.856	.092	.108
Information Quality (IFQ)	.310	.197	-.049	.064	.073	.776	.180	.128
	.126	.222	.014	.248	.221	.117	.778	.141
	.158	.273	-.006	.208	-.012	.135	.743	.217
Fintech Use (FU)	.198	.264	-.119	.257	.019	.148	.713	.181
	.196	.208	-.075	.208	-.094	.208	.081	.785
	.097	.203	.064	.295	-.072	.057	.081	.823
	.176	.152	.003	.223	.200	.190	.109	.748

Appendix C. Necessary condition test

We conducted a necessary condition test for all conditions. A condition was considered necessary if it was consistently present (or absent) in all cases in which the outcome was present (or absent) [29,96]. Table C.1 shows the test results, indicating that meaningfulness (MF) and information quality (IFQ) have a consistency higher than 0.9, demonstrating that they are necessary conditions for the high use of all Fintech types (note that meaningfulness in crowdfunding (0.898) is slightly lower than 0.9 but at an acceptable level). In addition, relative advantage (RA) can also be considered a necessary condition for high use in three Fintech types (mobile payments, mobile remittances, and P2P lending). Trust in transactions (TRU) is presented as a necessary condition for high use of mobile remittance and P2P lending (trust in transactions in P2P lending [0.897] is slightly lower than 0.9 but at an acceptable level). System quality (STQ) is presented as a necessary condition for mobile payments and remittances.

Furthermore, given the high averages of the three attributes (RA, MF, and STQ; 5.31, 5.21, and 5.25, respectively), we conducted a sensitivity analysis to validate the robustness of our findings [91]. In doing so, we conducted multiple necessary condition tests with varying calibrations for full non-membership, cross-over, and full membership. We first conducted a necessary condition test calibrated to 2, 4, and 6 for the three variables (RA, MF, and STQ). We then varied two calibrations to 2, 5, and 6 (RA1, MF1, and STQ1) and to 1, 4, and 7 (RA2, MF2, and STQ2) to test whether their high averages should be considered as new anchors for cross-over and for testing whether the lowest, the middle, and the highest should be considered as anchors, respectively. Table C shows the results of the necessary condition tests across the four Fintech types, demonstrating that RA, MF, and STQ remained valid and necessary for high Fintech use across different calibrations. Therefore, the fsQCA of these three variables can produce the same configurations with similar consistencies and coverages to achieve high Fintech use.

Table C1
Necessary condition tests.

Condition	High use							
	Mobile payments		Mobile remittance		P2P lending		Crowdfunding	
	Consistency	Coverage	Consistency	Coverage	Consistency	Coverage	Consistency	Coverage
RA	0.929	0.660	0.969	0.689	0.932	0.772	0.879	0.791
RA1	0.918	0.674	0.956	0.697	0.917	0.783	0.853	0.797
RA2	0.911	0.611	0.946	0.739	0.908	0.807	0.860	0.814
MF	0.937	0.686	0.948	0.747	0.918	0.811	0.898	0.780
MF1	0.917	0.625	0.938	0.755	0.902	0.833	0.871	0.808
MF2	0.910	0.699	0.926	0.783	0.898	0.828	0.879	0.733
PR	0.638	0.712	0.524	0.730	0.731	0.773	0.670	0.698
SA	0.775	0.767	0.795	0.824	0.852	0.786	0.768	0.818
TRU	0.838	0.736	0.905	0.779	0.897	0.754	0.841	0.780
STQ	0.918	0.645	0.916	0.719	0.905	0.757	0.894	0.734
STQ1	0.972	0.960	0.960	0.652	0.951	0.677	0.940	0.660
STQ2	0.906	0.686	0.901	0.757	0.903	0.713	0.887	0.772
IFQ	0.971	0.639	0.964	0.698	0.971	0.688	0.964	0.720

Note: RA: relative advantage, MF: meaningfulness, PR: perceived risk, SA: structural assurance, TRU: trust in transactions, STQ: system quality, IFQ: information quality.

Appendix D. Truth table analysis

The truth tables display all possible combinations of the causal conditions. Each row in Table D represents a combination of the attributes within the three Fintech dimensions for high use and not-high use. As mentioned in the manuscript, we applied two rules to set the cutoff value for consistency. First, the raw consistency of a combination should be above 0.8 to reliably produce high Fintech use. Second, the PRI consistency cutoff should be above 0.5 for high Fintech use.

For example, Table D1 shows that for high mobile payment use, the third row's raw consistency of 0.871 is above 0.8, and its PRI consistency of 0.546 is above 0.5. However, the fourth row's raw consistency of 0.820 is above 0.8, but its PRI consistency of 0.436 is below 0.5. Based on the minimum acceptable consistency for high Fintech use, we can set a value of 1 in the "high use" column for rows with a consistency higher than the cutoff; otherwise, it is set to 0. For not-high Fintech use in Table D2, the fifth row's raw consistency of 0.861 is above 0.8, and its PRI consistency of 0.564 is above 0.5. However, the sixth row's raw consistency of 0.844 is above 0.8, but its PRI consistency of 0.450 is below 0.5; thus, we can set the "not-high use" column to 1 for rows with a consistency above the cutoff, and all other rows are set to 0. As such, we ultimately set the high-use (or not-high-use) column to a value of 1 or 0 in the truth table, depending on the minimum acceptable consistency guideline.

Table D1Truth table for high mobile payment use ($N = 69$).

Combination	RA	MF	PR	SA	TRU	STQ	IFQ	Frequency	High Use	Raw Consistency	PRI Consistency
C1	1	1	1	1	1	1	1	4	1	0.912	0.677
C2	1	1	0	1	1	1	1	9	1	0.850	0.581
C3	1	1	0	0	1	1	1	2	1	0.871	0.546
C4	1	1	0	0	0	1	1	5	0	0.820	0.436
C5	0	1	0	1	1	1	1	3	0	0.884	0.289
C6	0	1	0	0	0	0	1	2	0	0.822	0.204
C7	1	0	0	0	1	1	1	2	0	0.831	0.185
C8	0	0	0	0	0	0	0	3	0	0.763	0.034

Table D2Truth table for not-high mobile payment use ($N = 69$).

Combination	RA	MF	PR	SA	TRU	STQ	IFQ	Frequency	Not-High Use	Raw Consistency	PRI Consistency
C1	0	0	0	0	0	0	0	3	1	0.992	0.966
C2	1	0	0	0	1	1	1	2	1	0.961	0.811
C3	0	1	0	0	0	0	1	2	1	0.955	0.796
C4	0	1	0	1	1	1	1	3	1	0.953	0.711
C5	1	1	0	0	0	1	1	5	1	0.861	0.564
C6	1	1	0	0	1	1	1	2	0	0.844	0.450
C7	1	1	0	1	1	1	1	9	0	0.776	0.372
C8	1	1	1	1	1	1	1	4	0	0.817	0.323

Table D3Truth table for high mobile remittance use ($N = 66$).

Combination	RA	MF	PR	SA	TRU	STQ	IFQ	Frequency	High Use	Raw Consistency	PRI Consistency
C1	1	1	0	1	1	1	1	13	1	0.928	0.845
C2	1	1	1	1	1	1	1	7	1	0.901	0.705
C3	1	1	0	0	1	1	1	4	1	0.894	0.675
C4	1	1	0	1	1	0	1	2	1	0.919	0.626
C5	1	1	0	0	0	1	1	3	1	0.880	0.568
C6	1	0	1	1	1	1	1	2	0	0.890	0.457
C7	1	0	1	0	0	1	1	2	0	0.788	0.094

Table D4Truth table for not-high mobile remittance use ($N = 66$).

Combination	RA	MF	PR	SA	TRU	STQ	IFQ	Frequency	Not-High Use	Raw Consistency	PRI Consistency
C1	1	0	1	0	0	1	1	2	1	0.978	0.906
C2	1	0	1	1	1	1	1	2	1	0.908	0.543
C3	1	1	0	1	1	0	1	2	0	0.863	0.370
C4	1	1	0	0	0	1	1	3	0	0.842	0.432
C5	1	1	0	0	1	1	1	4	0	0.780	0.325
C6	1	1	1	1	1	1	1	7	0	0.755	0.266
C7	1	1	0	1	1	1	1	13	0	0.598	0.140

Table D5Truth table for high P2P lending use ($N = 62$).

Combination	RA	MF	PR	SA	TRU	STQ	IFQ	Frequency	High Use	Raw Consistency	PRI Consistency
C1	1	1	1	1	1	1	1	13	1	0.927	0.852
C2	1	1	0	0	1	1	1	2	1	0.927	0.715
C3	1	1	0	1	1	1	1	5	1	0.900	0.676
C4	1	1	1	1	1	0	1	3	1	0.919	0.645
C5	0	0	1	1	1	0	1	6	0	0.798	0.156
C6	0	0	0	0	0	0	0	2	0	0.790	0.054

Table D6Truth table for not-high P2P lending use ($N = 62$).

Combination	RA	MF	PR	SA	TRU	STQ	IFQ	Frequency	Not-High Use	Raw Consistency	PRI Consistency
C1	0	0	0	0	0	0	0	2	1	0.988	0.946
C2	0	0	1	1	1	0	1	6	1	0.957	0.819
C3	1	1	1	1	1	0	1	3	0	0.853	0.355
C4	1	1	0	1	1	1	1	5	0	0.775	0.273
C5	1	1	0	0	1	1	1	2	0	0.813	0.265
C6	1	1	1	1	1	1	1	13	0	0.579	0.145

Table D7Truth table for high crowdfunding use ($N = 57$).

Combination	RA	MF	PR	SA	TRU	STQ	IFQ	Frequency	High Use	Raw Consistency	PRI Consistency
C1	0	1	1	1	1	0	1	2	1	0.975	0.835
C2	1	1	1	1	1	1	1	4	1	0.940	0.794
C3	1	1	0	1	1	1	1	6	1	0.912	0.754
C4	0	1	1	1	1	1	1	2	1	0.950	0.667
C5	1	1	0	0	0	1	1	4	1	0.873	0.620
C6	0	0	1	1	1	0	1	2	1	0.930	0.548

Table D8Truth table for not-high crowdfunding use ($N = 57$).

Combination	RA	MF	PR	SA	TRU	STQ	IFQ	Frequency	Not-High Use	Raw Consistency	PRI Consistency
C1	0	0	1	1	1	0	1	2	0	0.911	0.439
C2	1	1	0	0	0	1	1	4	0	0.791	0.378
C3	0	1	1	1	1	1	1	2	0	0.900	0.333
C4	1	1	0	1	1	1	1	5	0	0.730	0.246
C5	1	1	1	1	1	1	1	4	0	0.769	0.203
C6	0	1	1	1	1	0	1	2	0	0.876	0.165

Appendix E. Counterfactual analysis

After the truth table analysis, we conducted a counterfactual analysis to handle the rows without empirical cases and to reduce the many combinations into a few configurations. As noted in the manuscript, we did not make any assumptions about “easy counterfactuals,” so we do not get an intermediate solution. [Tables E1–E4](#) show the results of counterfactual analysis across Fintech types. As shown in [Tables E1–E4](#), the complex solutions were the same as the intermediate solutions. Therefore, we used complex and parsimonious solutions to refer to causal conditions that appear in both complex and parsimonious solutions as “core” and those that appear only in complex solutions as “peripheral.”

Table E1

Counterfactual mobile payment analysis.

Complex solution	Parsimonious solution	Intermediate solution
$RA^*MF^*\sim PR^*TRU^*STQ^*IFQ + RA^*MF^*SA^*TRU^*STQ^*IFQ \rightarrow$ High use $\sim RA^*\sim MF^*\sim PR^*\sim SA^*\sim TRU^*\sim STQ^*\sim IFQ +$ $\sim RA^*MF^*\sim PR^*\sim SA^*\sim TRU^*\sim STQ^*IFQ +$ $\sim RA^*MF^*\sim PR^*SA^*TRU^*STQ^*IFQ + RA^*\sim MF^*\sim PR^*\sim SA^*TRU^*STQ^*IFQ$ $+ RA^*MF^*\sim PR^*\sim SA^*\sim TRU^*STQ^*IFQ \rightarrow$ Not-high use	$RA^*MF^*TR \rightarrow$ High use $\sim RA +$ $\sim MF + \sim TR \rightarrow$ Not-high use	$RA^*MF^*\sim PR^*TRU^*STQ^*IFQ + RA^*MF^*SA^*TRU^*STQ^*IFQ \rightarrow$ High use $\sim RA^*\sim MF^*\sim PR^*\sim SA^*\sim TRU^*\sim STQ^*\sim IFQ +$ $\sim RA^*MF^*\sim PR^*\sim SA^*\sim TRU^*\sim STQ^*IFQ +$ $\sim RA^*MF^*\sim PR^*SA^*TRU^*STQ^*IFQ + RA^*\sim MF^*\sim PR^*\sim SA^*TRU^*STQ^*IFQ +$ $RA^*MF^*\sim PR^*\sim SA^*\sim TRU^*STQ^*IFQ \rightarrow$ Not-high use

Table E2

Counterfactual mobile remittance analysis.

Complex solution	Parsimonious solution	Intermediate solution
$RA^*MF^*\sim PR^*\sim SA^*STQ^*IFQ + RA^*MF^*\sim PR^*SA^*TRU^*IFQ +$ $RA^*MF^*SA^*TRU^*STQ^*IFQ \rightarrow$ High use $RA^*\sim MF^*PR^*\sim SA^*\sim TRU^*STQ^*IFQ + RA^*\sim MF^*PR^*SA^*TRU^*STQ^*IFQ \rightarrow$ Not-high use	$MF \rightarrow$ High use $\sim MF \rightarrow$ Not-high use	$RA^*MF^*\sim PR^*\sim SA^*STQ^*IFQ + RA^*MF^*\sim PR^*SA^*TRU^*IFQ +$ $RA^*MF^*SA^*TRU^*STQ^*IFQ \rightarrow$ High use $RA^*\sim MF^*PR^*\sim SA^*\sim TRU^*STQ^*IFQ RA^*\sim MF^*PR^*SA^*TRU^*STQ^*IFQ \rightarrow$ Not-high use

Table E3

Counterfactual P2P lending analysis.

Complex solution	Parsimonious solution	Intermediate solution
$RA*MF*\sim PR*TRU*STQ*IFQ + RA*MF*PR*SA*TRU*IFQ \rightarrow$ High use $\sim RA*\sim MF*\sim PR*\sim SA*\sim TRU*\sim STQ*\sim IFQ +$ $\sim RA*\sim MF*PR*SA*TRU*\sim STQ*IFQ + \rightarrow$ Not-high use	$RA+MF \rightarrow$ High use $\sim RA + \sim MF \rightarrow$ Not-high use	$RA*MF*\sim PR*TRU*STQ*IFQ + RA*MF*PR*SA*TRU*IFQ + \rightarrow$ High use $\sim RA*\sim MF*\sim PR*\sim SA*\sim TRU*\sim STQ*\sim IFQ +$ $\sim RA*\sim MF*PR*SA*TRU*\sim STQ*IFQ + \rightarrow$ Not-high use

Table E4

Counterfactual crowdfunding analysis.

Complex solution	Parsimonious solution	Intermediate solution
$\sim RA*PR*SA*TRU*\sim STQ*IFQ + RA*MF*SA*TRU*STQ*IFQ +$ $\sim RA*MF*PR*SA*TRU*IFQ + MF*PR*SA*TRU*STQ*IFQ +$ $RA*MF*\sim PR*\sim SA*\sim TR*STQ*IFQ \rightarrow$ High use	None	$\sim RA*PR*SA*TRU*\sim STQ*IFQ + RA*MF*SA*TRU*STQ*IFQ +$ $\sim RA*MF*PR*SA*TRU*IFQ + MF*PR*SA*TRU*STQ*IFQ +$ $RA*MF*\sim PR*\sim SA*\sim TR*STQ*IFQ \rightarrow$ High use

Appendix F. Applicability check on the research model for high Fintech use

We conducted an applicability check to evaluate the relevance of our research findings for Fintech practitioners. This check is an exploratory approach to test the feasibility of research in practice. Based on Rosemann and Vessey [99], we conducted a check at the final stage of our research life cycle, focusing on the just-completed research. To ensure realistic feedback, we organized focus groups of experienced Fintech professionals for this first attempt at an applicability check. All participants had extensive work experience, including experience in Fintech in the financial sector. To maintain the homogeneity of the focus groups, we conducted separate focus group interviews for Fintech providers and regulators. Prior to the interviews, we provided all participants with research summaries and videos about the research object, model, and findings of our study. One of our research team members served as the moderator, guiding the interview process for this applicability test. We opened each focus group with the question “What do you think is the most important factor to promote Fintech use in terms of technology and business?” We then introduced our research model and asked any related questions. The final question posed to the focus group was “Would you consider using our findings to promote Fintech use in your organization? If not, why not?” Table F shows the characteristics of the participants in our focus group interviews.

Table F1

Participant characteristics in the focus group interviews.

Interviewees	Focus Group	Institution Type	Company	Position	Job Description	Work Experience ^a	Fintech Delivery
PV1	1	Bank	Toss Bank	CISO*	Information security and privacy	Over 15	Yes
PV2	1	Payment	Coupang Pay	Team Manager	Fintech IT systems	23	Yes
PV3	1	Credit Card	Hana Card	Senior Manager	Fintech payment and remittance	22	Yes
RG1	2	Central Bank	Bank of Korea	Team Leader	Financial institution management	Over 15	No
RG2	2	Financial Association	Korea Life Insurance Association	Senior Advisor	Digital policies and IT planning	Over 20	No
RG3	2	Law firm	Kim & Chang	Senior Advisor	Financial IT legal consulting	Over 15	No

tes: PV: Personnel in companies providing financial services to users. RG: Personnel in institutions related to financial regulations. CISO: Chief Information and Security Officer.

^a Work experience includes all experience in financial IT systems, electronic financial payments, financial IT, and Fintech.

Focus Group I: Fintech providers (PV). The first focus group consisted of three Fintech providers from both the Fintech and financial industries. One member was a CISO (chief information and security officer) in the IT department of a bank, while the other two were a team manager and a senior manager in the financial IT operations departments of payment and credit card companies, respectively.

The group emphasized the importance of easy access and ease of use to encourage users to adopt and continue to use Fintech. They identified existing challenges, such as complex financial terms, services, and procedures, and highlighted the value of eliminating these inconveniences. They observed that younger users in their 20s and 30s prioritized ease of use over financial benefits, whereas users over 40 were more concerned with financial benefits. Therefore, the group emphasized the need for integrated financial services that transcend individual sectors such as banking, insurance, and securities to improve easy-to-use experiences and deliver new value to users. In addition, they emphasized the importance of resilience, security, and privacy as key factors in promoting Fintech use. Resilience refers to the ability to withstand and recover from various technical challenges, disruptions, or shocks while maintaining functionality, stability, and growth. Thus, they asserted that strong IT capabilities are required for Fintech companies to achieve resilience in various technical challenges. As Fintech deals with sensitive and personal financial information, security and privacy are also critical. However, they acknowledged that government regulations still constrain Fintech innovation. Although the regulations have recently been somewhat relaxed, they are still perceived as barriers to Fintech adoption and use in practice.

Focus Group II: Fintech regulators and legal consulting firms (RG). The second focus group consisted of three participants who were Fintech regulators and members of a legal consulting firm, each with a different background in the financial industry. One member was a team leader at the Bank of

Korea, which performs typical central bank functions: issuing banknotes and coins, formulating and implementing monetary and credit policy, and serving as the government's bank in South Korea. The second member was a senior advisor at the Korea Life Insurance Association, a non-profit corporation focused on the healthy development of the life insurance business. The third member was a senior advisor specializing in IT legal consulting for financial companies at Kim & Chang, the largest law firm in South Korea.

The group emphasized that trust, rather than innovation, is crucial in Fintech. They suggested that innovative technologies should only be applied to Fintech if proven stable in the financial market. They cautioned against excessive structural assurance, which could lead to increased regulations in the domestic Fintech sector. In particular, this would create challenges for small Fintech companies to comply with regulations. The group highlighted the importance of Fintech moving away from the monotonous services of traditional financial companies and providing newer, more diverse, fun, safe, and useful services. The participant from the Bank of Korea noted that Fintech is critical in attracting big tech companies to the financial industry. They pointed out that early-stage companies such as Toss (a Fintech company) can grow into large companies with innovative Fintech and eventually become a steppingstone for IT platform giants such as Kakao, Naver, Coupang, and Samsung to enter the financial industry. This trend is influenced by a special Korean regulation, the *Separation of Banking and Commerce*, which restricts the combination of financial and industrial capital, preventing traditional financial institutions from leading the Fintech market. Therefore, there have been calls to regulate big tech companies while relaxing the Separations of Banking and Commerce principles due to concerns about monopoly, financial security, and privacy.

Evaluation of the applicability check. We evaluated the applicability check of our research findings based on three dimensions: *importance*, *accessibility*, and *suitability*. Regarding importance, which assesses the fit of the research to practice, most focus group participants expressed that our research model and findings are important. They found our Fintech theoretical framework suitable for explaining the key aspects of Fintech and suggested that clarifying the meanings of terms such as “innovation & financial services,” “innovation & IT,” and “financial services & IT” would enhance understanding. Participants confirmed the appropriateness of seven research constructs (relative advantage, meaningfulness, perceived risk, structural assurance, trust in transactions, system quality, and information quality) to explain Fintech use. They recommended conducting more in-depth research on additional attributes specific to the different types of Fintech. In addition, all participants agreed that our study was timely, as the early stages of Fintech appear to be ending, necessitating an examination of what Fintech companies must focus on to survive in the market.

With respect to accessibility, some of the participants shared their experiences of applying research findings to their work after reading academic journals. Specifically, three participants from Fintech providers mentioned using the research model and findings to convince collaborators or boards of directors with biased views. While several participants expressed that some aspects of the research model and findings were difficult to understand, most had no problems understanding the core of the research. They believed the research findings would be helpful in their work and expressed a willingness to read our research paper when it is published. However, three participants, including two from Fintech regulators and one from a law firm, noted that a lack of accessibility was a critical barrier to putting Fintech research into practice. They suggested that our research would be more understandable if it were explained using terms and concepts commonly used in the industry.

Regarding suitability, most participants found our research model suitable for improving Fintech use. A senior manager from a credit card company suggested that our research model can be used as a checklist during Fintech planning and before launching new initiatives. A participant from a payment company said that our research suggestions could help Fintech companies explore different ways of delivering Fintech to different user segments. However, some participants mentioned the need for more opinions and studies before putting our research findings into practice. They emphasized the need to conduct more empirical research on various Fintech aspects.

Overall, most participants responded positively to the three dimensions of applicability (importance, accessibility, and suitability) in our research findings, although several expressed some reservations. Four participants ranked suitability as the most significant dimension, while two ranked importance as the most critical. It is encouraging that all participants recognize the value of our research model. However, accessibility received the lowest rating among the dimensions. Two participants expressed skepticism, highlighting the distinction between suitability and applicability and suggesting the need for practical demonstrations based on our research model. While there were some concerns about accessibility and the practicality of academic research, the overall feedback was positive. A limitation of our study is that the applicability check was conducted as a complementary measure. Conducting an applicability check at both the initial and final stages would have enhanced our research. Therefore, the applicability check we used was exploratory in nature. Nevertheless, our research contributes to IS research by providing detailed information based on feedback received during the check.

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