CONSUMER RESISTANCE TO MOBILE PAYMENT: AN EMPIRICAL ANALYSIS FOR ITALY

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ABSTRACT

Mobile payments provide several benefits, for both consumers and merchants, from increased convenience, security, and speed to reduced transaction costs and higher customer loyalty. Nevertheless, the usage of mobile payments worldwide is still low. Accordingly, the objective of this paper is to investigate the factors that hinder mobile payment usage by consumers. The theoretical framework for the study is based on the Innovation Resistance Theory (IRT). To empirically assess the proposed research model, we gathered data on mobile payment usage in Italy through a web-based survey. The findings suggest that usage, risk and tradition barriers negatively affect the usage of mobile payments. On the other hand, image barrier did not have a significant impact. Finally, we found that the two items previously used in extant studies to measure value barrier do not fit the context of mobile payment usage in Italy, with only one of them negatively affecting the usage of mobile payment instruments. Theoretical as well as practical implications are discussed.

KEYWORDS

Mobile payment; Innovation Resistance Theory; Italy

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INTRODUCTION

The payments industry has changed tremendously over the past decades (Balakrishnan & Shuib, 2021). The progress of information technology has enabled innovation in electronic payments, and the adoption of this type of payments has continued to grow, thanks to its increased safety and convenience (Tee & Ong, 2016). An important trend that has received growing attention in the industry is mobile payment (Oliveira et al., 2016), which is defined by the European Central Bank (ECB) as "*a payment where a mobile device is used at least for the initiation of the payment order and potentially also for the transfer of funds*"[1].

Mobile payments provide several benefits for both consumers and merchants, from increased convenience, security and speed to reduced transaction costs and higher customer loyalty (Johnson et al., 2018; Slade et al., 2013). Nevertheless, the adoption of mobile payments worldwide is still low (Johnson et al., 2018). Moreover, according to a survey conducted by Statista Digital Market Insights (Statista, 2021), the penetration of mobile payments at the Point of Sale (POS) is still heterogeneous, with mobile payments being more used in Asian countries. For instance, in 2021 China recorded the highest mobile POS payment penetration (39.5%), compared to only 17.7% in the US and 14.4% in the European Union (EU) (Statista, 2021).

Accordingly, the objective of this paper is to investigate the barriers to the usage of mobile payments by consumers, analyzing the behavior of both users and non-users. Several studies have analyzed the adoption and usage of mobile payments in various countries, for instance in Finland, Germany, Indonesia, Japan, South Africa, South Korea and the US (Guhr et al., 2013; Humbani & Wiese, 2017, 2018; Martens et al., 2017; Rafdinal & Senalasari, 2021; S. Shin & Lee, 2014; Wiese & Humbani, 2020). However, the research is mainly focused on adoption behavior, whereas identifying the barriers to adoption could be a greater opportunity for both practitioners and scholars (Laukkanen, 2016; Talwar et al., 2020). Indeed, only few studies try to investigate consumer resistance towards mobile payments (Ghosh, 2022; Kaur et al., 2020; Talwar et al., 2021).

To address this gap, our study investigates the factors hindering the usage of mobile payments by applying the Innovation Resistance Theory (IRT) (Ram, 1987; Ram & Sheth, 1989). Our analysis tests the validity of the theory in Italy, which is a geographical context that, to the best of our knowledge, has not yet been investigated. Migliore et al., (2022) investigate the adoption of mobile payment in Italy. However, the authors analyze the adoption gap between Italy and China, thereby focusing on the users' intention to adopt mobile payment, without considering the behavior of non-users. Further, they integrate IRT with the unified theory of acceptance and use of technology 2 (UTAUT2), without testing the theory as originally formulated.

Our analysis focuses on the Italian context because of its relevance, as discussed in paragraph 0.

The rest of the paper is organized as follows. Section 2 sets the stage by describing the Italian payments landscape. Section 3 presents the theoretical framework and section 4 explains the method and data collection. Results are presented and discussed in sections 5 and 6, respectively. Finally, section 7 concludes.

THE ITALIAN PAYMENTS LANDSCAPE

We have studied mobile payment usage in the Italian context because the Italian case is of particular interest for several reasons. According to the payments statistics published by the European Central Bank, (2021), the infrastructure for the acceptance of digital payments is well-developed in

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[1] https://www.ecb.europa.eu/services/glossary/html/glossm.en.html#598

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Italy. As of 2020, the number of POS terminals was well above the EU average (60,647 and 32,663 POS terminals per million inhabitants, respectively) and there were 1.99 payment cards per capita, slightly above the EU average (1.92). However, the actual usage of digital payments is still low. For instance, in 2020 the number of card payments per capita was equal to 81 in Italy, while the EU average was 146 (European Central Bank, 2021; Innovative Payments Observatory, 2022b).

The same is true for mobile payment as well. In 2021 the number of Italian smartphone users was equal to 32.9 million (54.5% penetration rate) (Statista, 2022). However, the usage of smartphones to make transactions is still very low. For instance, in 2021 only 8.8% of the overall transactions at the POS were made through mobile payment, compared to 14.4% in the EU (Statista, 2021).

Mobile payment in Italy mainly takes two forms: (1) digital wallet based on near-field communication (NFC) technology, and (2) digital wallet based on other technologies, such as geolocation or QR codes (Innovative Payments Observatory, 2022b). The first type includes wallets such as Apple Pay, Google Pay and Samsung Pay. These wallets allow consumers to make transactions by bringing the smartphone closer to the merchant's contactless card reader and are the most used mobile payment services in Italy (Innovative Payments Observatory, 2022a). The second category includes apps that allow users to make account-to-account payments, both in a business-to-consumer setting and in a peer-to-peer setting. The main app in the Italian framework is Satispay, which counts over 3.6 million users[2].

THEORETICAL FRAMEWORK

The paragraph discusses the theoretical framework behind the analysis. First, the IRT is presented, then the research model is proposed, together with the hypotheses.

Innovation Resistance Theory (IRT)

We resorted to IRT because it is the most frequently used theory when analyzing barriers to the adoption and usage of digital innovations, as it provides crucial information on how consumers react to them (Talwar et al., 2020). More specifically, Talwar et al., (2020) review the literature on consumer resistance to digital innovations. They analyze 54 articles, finding that 55% of them used IRT as the basis for the empirical setting, while the remaining resorted to other theories such as the Diffusion of Innovation (DOI), means-end approach, dual-factor perspective, etc. (Talwar et al., 2020).

IRT was first formulated by Ram, (1987) and then modified by Ram & Sheth, (1989). Innovation resistance is defined by Ram & Sheth, (1989, p.6), as *"the resistance offered by consumers to an innovation, either because it poses potential changes from a satisfactory status quo or because it conflicts with their belief structure".* The IRT identifies five barriers that obstruct the adoption of an innovation. These five barriers can be grouped into functional and psychological barriers.

Functional barriers emerge when consumers perceive significant changes resulting from the adoption of the innovation (Ram & Sheth, 1989). Functional barriers number three, namely: (1) usage barrier, which refers to the usability of the innovation and the adjustments that consumers need to undergo to use it (Laukkanen, 2016; Ram & Sheth, 1989; Talwar et al., 2020); (2) value barrier, which arises from the comparison of an innovation's performance and monetary worth with its alternatives (Ram & Sheth, 1989); and (3) risk barrier, which is the degree of risk inherent in an innovation (Ram & Sheth, 1989).

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[2] https://www.satispay.com/en-it/, accessed on April, 13th, 2023.

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Psychological barriers are more likely to arise if the innovation conflicts with consumers' prior beliefs (Ram & Sheth, 1989). According to the IRT, there exist two types of psychological barriers, namely: (1) tradition barrier, which arises when the innovation creates a cultural change for the consumers, thereby requiring them to deviate from previously established traditions (Ram & Sheth, 1989); (2) image barrier, which occurs when the identity acquired by the innovation - based on the product category or the country of origin - creates a negative perception leading to an undesirable image of the innovation itself (Ram & Sheth, 1989).

The IRT has been applied to investigate consumers' resistance towards mobile payments in different countries and settings. For instance, Kaur et al., (2020) resort to IRT to analyze the barriers related to mobile payments in India but focus on the users' intention to use and recommend it. Talwar et al., (2021) focus on the Indian framework as well and use IRT to investigate the resistance towards mobile payments by smartphone users who do not use mobile payments during the COVID-19 pandemic. Other authors, instead, integrate IRT with other IS theories or constructs. For example, Ghosh, (2022) investigates the barriers to the adoption of mobile payments among Indian users. The author resorted to IRT, to which other barriers were added (habitual use of cash, surveillance, technology). Migliore et al., (2022) integrate IRT with the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) to investigate the adoption gap in the user's intention to adopt mobile payments between China and Italy.

Research model and hypothesis

We used the IRT to formulate a research model to measure the impact of the functional and psychological barriers on the decision to use mobile payments. We test hypotheses using a binary logit model comparing mobile payments users versus non-users, where the dichotomous dependent variable is mobile payments user vs. non-user and the independent variables are the five IRT barriers.

The first functional barrier is usage barrier, as defined in section "Innovation Resistance Theory (IRT)". Extant studies show that usage barrier is negatively associated with the intention to adopt and use digital innovations, such as mobile commerce (Moorthy et al., 2017). Similarly, both Kaur et al., (2020) and Ghosh, (2022) find that usage barrier hinders the intention to use mobile payments for Indian consumers. As a consequence, the following hypothesis is posited:

H_1: Usage barrier negatively impacts the usage of mobile payments.

The second functional barrier is value barrier, as defined in section "Innovation Resistance Theory (IRT)". If the proposed innovation does not provide any advantage compared to the existing product, then consumers are likely to resist (Ghosh, 2022). Extant studies confirmed that value barrier hinders the adoption of technology like mobile banking (Laukkanen, 2016), mobile commerce (Moorthy et al., 2017) and mobile payments (Ghosh, 2022; Kaur et al., 2020; Talwar et al., 2021). Accordingly, it is proposed that:

H_2: Value barrier negatively impacts the usage of mobile payments.

Finally, risk barrier, as defined in section "Innovation Resistance Theory (IRT)", is the third functional barrier. If consumers perceive that an innovation is risky, they might decide not to use it until they acquire additional knowledge about it (Ram & Sheth, 1989). Scholars have documented that risk barrier can prevent consumers from adopting an innovation, such as mobile commerce (Moorthy et al., 2017) and mobile payments (Kaur et al., 2020; Talwar et al., 2021). Thus, based on the existing literature, it is proposed that:

H_3: Risk barrier negatively impacts the usage of mobile payments.

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Tradition barrier, as defined in section "Innovation Resistance Theory (IRT)", is the first psychological barrier. Very often, consumers are used to certain routines (Ghosh, 2022). If consumers are asked to deviate significantly from what they are accustomed to, the resistance towards the innovation is greater (Ram & Sheth, 1989). Previous studies have confirmed a negative relationship between tradition barrier and the adoption of a technology, like mobile commerce (Moorthy et al., 2017) and payments (Talwar et al., 2021). Consistently, we propose that:

H_4: Tradition barrier negatively impacts the usage of mobile payments.

The last psychological barrier is image barrier, as defined in section "Innovation Resistance Theory (IRT)". When innovations are proposed, consumers tend to associate them with an image that can be derived from the innovation itself, for instance, the product class or industry, or the country of origin (Ram & Sheth, 1989). If the association is not favorable, then consumers may resist the innovation (Ram & Sheth, 1989). The negative relation between mobile payment adoption and image barrier has been confirmed by previous studies (Ghosh, 2022; Talwar et al., 2021). For this reason, it is posited:

H_5: Image barrier negatively impacts the usage of mobile payments.

METHOD AND DATA

The target population is composed of adult (18+) Italian consumers. To collect the data, we designed a questionnaire that included constructs and scales derived from previous studies (Laukkanen, 2016; Migliore et al., 2022), as shown in Appendix A. We used a 5-point Likert scale, ranging from "strongly disagree" to "strongly agree" to measure the items.

The questionnaire was administered in Italian. Since the questions drawn from the literature were in English, the questionnaire was first drafted in English and then translated into Italian. The Italian version was then double-checked by several members of the team.

The questionnaire underwent two preliminary assessments. The first pre-test was conducted with the help of Ipsos, a firm specialized in market research, while the second pre-test was conducted with the main players of the payment industry[3]. Based on the feedback received, changes were made in order to better reflect the context of the study and to ensure that the items were understandable and relevant to respondents. More specifically, we were advised to decrease the number of questions, to reduce respondent burden, which is not uncommon in the literature (Ferreira et al., 2022; Parasuraman & Colby, 2015; H. Shin et al., 2021; S. Shin & Lee, 2014). For this reason, four items were dropped when measuring the factors for IRT (see Appendix A for more details).

The questionnaire was administered by Ipsos. To ensure representativeness we resorted to quota controls. The sampling was conducted using software that selects potential respondents who match the target using interactive selection algorithms based on marginal and crossed quotas. The survey was carried out between November 2022 and December 2022, using Computer-Assisted Web Interviewing (CAWI) methodology. A total of 2,000 answers were gathered. Analyses were performed using Stata 17 software.

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[3] The questionnaire was sent for a preliminary assessment to the following companies: Accenture, Agos, American Express, Banca Cambiano 1884, Banca di Asti, Banca Mediolanum, Banca Popolare di Sondrio, Banco BPM, Bancomat, Bibanca, BNL - Gruppo BNP Paribas, Cassa Centrale Banca, CRIF, CUSTOM, Deloitte, Deutsche Bank, Ennova, EY, HYPE, ING, Ingenico, Intesa Sanpaolo, Ipsos, Keyless, Klarna, Konvergence, LIS Holding, Market Pay, Mastercard, Mooney, N&TS GROUP, Nexi, PAX Italia, Pay Reply, PayDo, PayPal, Postepay, PwC, Q8, ReActive, Scalapay, Sinergia, Sparkasse – Cassa di Risparmio di Bolzano, UNGUESS, UniCredit, UnipolSai, Visa, Worldline Zucchetti.

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RESULTS

The paragraph presents the results of the empirical analysis. First, the assessment of factors for IRT is presented, then the results of the logit regression are discussed.

Assessment of IRT Factor Structure

To assess the general data structure, we conducted Principal Component Analysis (PCA) using Varimax Rotation of the factor loadings. The item VB1 and VB2, related to value barrier, have a low correlation (0.3023) and low Cronbach's alpha (0.4643), showing that reliability of the factor value barrier is an issue. For this reason, we decided to maintain VB1 and VB2 as stand-alone variables. This difference in the items might be due to their phrasing (see Appendix A for more details). More specifically, VB1 refers to the general advantages that mobile payments might provide, while VB2 specifically refers to the possibility given by mobile payments to better control one's spending. Since both items represent a comparison of mobile payments performance with its alternatives, H_2 is divided into two hypotheses and rephrased as follows:

H_{2a}: VB1 negatively impacts the usage of mobile payments.

H_{2b}: VB2 negatively impacts the usage of mobile payments.

Then, a second PCA was run, maintaining only the factors related to the remaining four barriers. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy is equal to 0.80, showing that the data are suited for factor analysis.

Table 1 shows the factor loadings for the items, which are all strong. The factors were named according to the literature. Reliability was checked by computing Cronbach's alpha: the lowest reliability is 0.74 for risk barrier and the highest is 0.85 for usage barrier.

Construct	Item	Factor loading	Cronbach's alpha
Usage barrier	UB1	0.688	0.852
	UB2	0.711	
Risk barrier	RB1	0.800	0.739
	RB2	0.594	
Tradition barrier	TB1	0.650	0.829
	TB2	0.753	
Image barrier	IB1	0.743	0.834
	IB2	0.659	

Table 1 - Constructs of the IRT factor analysis and relative items, factor loadings and Cronbach's alpha

IRT regression

The study tests the proposed hypotheses by running a logistic regression model where the binary dependent variable is "mobile payments user" which is equal to 1 if the respondent has used mobile payment at least occasionally in the past year, and equal to 0 otherwise. The independent variables are "usage barrier", "risk barrier", "tradition barrier", "image barrier", and "VB1" and "VB2" as stand-alone variables.

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A significant χ^2 (p = 0.000) indicates a good fit of the data in the model. Additionally, the model appears to have a high level of accuracy in predicting the phenomenon, with a classification accuracy of 85.25%. The results of the model (Table 2) show that usage barrier is the greatest obstacle to mobile payments usage, followed by VB2, risk and tradition barriers. On the contrary, VB1 and image barriers do not significantly affect the usage of mobile payment methods. Hence, the results support hypotheses H_1, H_{2b}, H_3, and H_4, while hypotheses H_{2a} and H_5 are not supported.

Dependent variable	Independent variables	ß	S.E.	P-value	Sig.	Hypotheses
Mobile payment user						
	Usage barrier	-.4627	.0790	0.000	Yes	H_1 - Supported
	VB1	-.1190	.0907	0.190	No	H_{2a} - Not supported
	VB2	-.4058	.0913	0.000	Yes	H_{2b} - Supported
	Risk barrier	-.2449	.0768	0.001	Yes	H_3 - Supported
	Tradition barrier	-.2214	.0661	0.001	Yes	H_4 - Supported
	Image barrier	.1193	.0753	0.113	No	H_5 - Not supported
	Constant	-2.0303	.0812	0.000	Yes	

Table 2 - Logistic regression results

DISCUSSION

The objective of the study is to analyze which barriers prevent consumers from using mobile payment instruments. The analysis assumes that consumers resist innovation to a certain degree and theorizes that the five adoption barriers identified by IRT explain the usage of mobile payments by consumers.

The usage barrier seems to be the greatest impediment to mobile payment usage. Usage barrier arises when the innovation requires consumers to change their habits: the greater the required adjustment, the greater the resistance. Traditional payment instruments, like cash, are still widespread in Italy, and for the majority of consumers paying with cash is a habit, meaning that switching from cash to mobile payment requires a significant adjustment. This result is consistent with the findings of previous studies (Ghosh, 2022; Kaur et al., 2020).

Interestingly, VB1 does not play a significant role in preventing consumers from using mobile payment methods, whereas VB2 does. VB1 refers to general advantages that mobile payment instruments may provide when compared to other payment instruments. Given that mobile payment is still an underused innovation in Italy, consumers might find it difficult to evaluate its general benefits, thereby giving them less importance. On the contrary, VB2 specifically refers to the possibility granted by mobile payments to better control one's spending and it might be easier for respondents to evaluate the importance of this (potential) benefit because it is well-defined. Moreover, the results of the analysis suggest that this particular feature is valued by consumers, and the lack of it constitutes a barrier to usage.

The third barrier identified by the analysis is risk barrier. If consumers perceive mobile payment as risky, they will refrain from using it. This result is in line with previous literature (Kaur et al., 2020; Talwar et al., 2021).

Tradition barrier has a negative effect on mobile payment usage as well. The usage of cash is still predominant in Italy, suggesting that starting to use a cashless instrument like mobile payment may

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require a cultural change for consumers, thereby constituting a barrier. This result contrasts with Ghosh, (2022) and Kaur et al., (2020), which both find tradition barrier to play no significant role in preventing mobile payments adoption and intention to use, respectively. Both authors focused their analyses on the Indian context, where mobile payment usage is more widespread compared to Italy (Statista, 2021). As a consequence, Italian consumers may perceive mobile payments as a bigger cultural change, thus resisting it.

Finally, the results do not support the hypothesis that image barrier negatively affects the usage of mobile payment. Previous literature found discording results, with Ghosh, (2022) and Talwar et al., (2021) providing evidence in favor of the hypothesis, while Kaur et al., (2020) found that image barrier does not play a significant role. The probable explanation could be that a negative image alone is not sufficient to constitute a barrier, at least in the Italian context.

Theoretical contributions

From a theoretical perspective, the study tested the classical IRT model in a developed country, i.e. Italy, where the usage of mobile payments is still low. The empirical analysis shows that IRT has some limitations in the proposed empirical setting. Indeed, only usage, risk and tradition barriers play a significant role in explaining mobile payments usage, as formulated by the theory. Image barrier is found not to play a significant role in preventing consumers from using mobile payments. Literature is not homogeneous in this sense, with Ghosh, (2022) and Talwar et al., (2021) providing evidence in favor of the hypothesis, while Kaur et al., (2020) providing evidence against it. Our study adds to the literature by confirming the results of Kaur et al., (2020), thereby suggesting that further investigation is needed.

Further, the construct value barrier as framed by the literature seems not to be valid in our case. The two items turned out to be not correlated, thereby suggesting that they could be rephrased for future research. More specifically, being mobile payment still a relatively new technology, because of its lower usage in Italy, referring to general benefits did not work in our case. On the contrary, mentioning a specific potential benefit did work. This finding suggests that future research should adapt the phrasing of the items to the context and to the innovation under investigation, referring to specific benefits provided by the innovation itself.

Practical contributions

From a practical perspective, the study provides knowledge about the factors that can help mobile payment providers increase the reach of their products. In this regard, the study suggests that players should focus on reducing the usage barrier perceived by consumers. Usage barrier refers to the effort that a user has to make in order to use the innovation. For example, mobile payment providers could try to develop simple-to-use products with a straightforward user experience, so that their usage does not bring drastic changes to users' daily payment habits.

The significant impact of VB2 suggests that mobile payment instruments should provide actual benefits compared to other payment instruments. This suggests that mobile payment providers should try to understand the need of consumers and try to provide products that answer those needs, providing valuable benefits. Another implication might relate to communication: mobile payment providers could exploit communication campaigns to highlight the benefits provided by their products, especially when compared to other payment instruments.

Further, the significant impact of risk barriers may suggest that mobile payment providers should also focus on factors that make users feel secure while paying with their smartphones, both trying to

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keep working on guaranteeing the safety of their products and communicating it to consumers, thereby reassuring them.

Finally, tradition barrier might be more difficult to overcome for mobile payment providers, because it has to do with consumers' habits and cultural background. However, the importance of this barrier suggests that it should be tackled to improve the usage of mobile payments. An important role in this sense could be played by public institutions, which could develop policies to increase the awareness of consumers of the importance and benefits provided by mobile payment instruments.

CONCLUSION

Barriers to mobile payment usage are still a rather unexplored topic in Italy. Thus, our study applied the IRT to the Italian context, to investigate which factors are preventing consumers from using mobile payment services. First, we empirically tested IRT in Italy, thus verifying the generalizability of the theory in a different geographical context. The negative impacts of usage barrier, risk barrier and tradition barrier are confirmed. However, our analysis did provide evidence against a significant role of image barrier, thereby suggesting that further investigation is needed. Further, we found that the two items previously used in extant studies to measure value barrier do not fit the context of mobile payments usage in Italy, indicating that future studies should adapt the phrasing of the items to the technology under investigation.

Second, the study provided practical implications by highlighting the barriers that both mobile payment providers and public institutions should tackle to enhance mobile payment usage in Italy.

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APPENDIX A

Construct	Measure item		Reference
Usage barrier	UB1	In my opinion, mobile payments are easy to use. [a]	Laukkanen, (2016)
	UB2	In my opinion, mobile payments are convenient. [a]	
	UB3	*In my opinion, mobile/Internet banking services are fast to use [a] (dropped).*	
	UB4	*In my opinion, progress in mobile/Internet banking services is clear [a] (dropped).*	
	UB5	*The use of changing PIN codes in mobile/Internet banking services is convenient [a] (dropped).*	
Value barrier	VB1	In my opinion, mobile payments do not offer any advantage compared to other payment instruments.	Laukkanen, (2016)
	VB2	In my opinion, the use of mobile payments increases my ability to control my spending. [a]	
Risk barrier	RB1	I fear that while I am using mobile payments, the connection will be lost.	Laukkanen, (2016)
	RB2	I fear that mobile payments are not safe to use.	
	RB3	*I fear that the list of PIN codes may be lost and end up in the wrong hands (dropped).*	
Tradition barrier	TB1	I prefer cash to mobile payments.	Migliore et al., (2022)
	TB2	If I use cash, I can more easily realize my financial assets.	
Image barrier	IB1	In my opinion, new technology is often too complicated to use.	Laukkanen, (2016)
	IB2	I believe that mobile payments are too difficult to be useful	

Table 3 - Measurement scales for IRT. [a] Reversed scale

Note 1: the items derived from Laukkanen, (2016) were originally phrased to investigate Internet banking and mobile banking. The phrasing of the items has been slightly changed to adapt it to the context of mobile payments.

Note 2: we dropped UB3 because an increased speed granted by mobile payments might be perceived by respondents as value-added, therefore making it similar to the category of value barrier; UB4 because mobile payments are still a relatively new and unknown technology in Italy and respondents might find it difficult to evaluate its progress; UB5 because the majority of mobile payments services does not involve the use of changing PIN codes; RB3 because the list of PIN codes relates more to (physical) payment cards, while the majority of mobile payments solutions resort to the smartphone PIN code or biometric authentication (such as face or fingerprint scan).