Customers' intentions to adopt proximity m-payment services: empirical evidence from Greece

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Abstract: The purpose of this study is to analyse the factors that determine consumers' intentions to adopt NFC proximity mobile payment services. An extended version of the decomposed theory of planned behaviour (DTPB), a model that incorporates the most relevant theoretical approaches in the mobile payment adoption literature was selected to investigate the consumer's adoption process. To empirically test the proposed model's nomological validity, data were collected from 513 consumers of mobile internet service providers in Greece and were analysed using PLS. The results indicated that consumers' *attitude* about the NFC proximity mobile payment services is the main driver of consumers' intentions to use it, followed by their normative, control and risk beliefs. As far as the behavioural intentions determinants' structure is concerned, consumer's perception about service attributes compatibility and performance (i.e., usefulness, easiness, and reduced riskiness), the availability of knowledge, resources, and opportunities necessary for using the service and the support of the interpersonal and the external social context toward the usage of the technology found to be adoption facilitators. Theoretical and managerial implications, limitations and suggestions for further research are provided at the end of the study.

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1   Introduction

M-commerce has created new business opportunities through exploiting the innovative capabilities of emerging devices (i.e., smartphones, tablets, and wearables) in providing technology-based services. As they are evolving, new technologies (i.e., mobile networks, mobile devices, and the Internet) are becoming fully-integrated within the lives of scores of users attracted to them (Oliveira et al., 2016). Conducting transactions through mobile network devices can make the whole process more convenient, valued and enjoyable to the consumer and, ultimately, more efficient for the business (e.g.,

Vrontis et al., 2017). Among existing m-commerce applications (i.e., mobile marketing/advertising, m-banking, m-brokerage, m-gaming etc.) m-payment, offering payment services through mobile devices without locational and temporal restrictions, is considered the most vital (Dahlberg et al. 2015; Oliveira et al., 2016). M-payment is considered, along with SMS marketing, mobile coupons and vouchers, smartphone- and tablet-specific mobile retail applications, as a critical component of a mobile retailing platform which is specifically made for the mobile channel in order to be successful among the customers (Vrontis et al., 2017). According to Slade et al. (2013), m-payment main benefits to the consumer are convenience and speed while to merchants are increased sales, reduced transaction costs, and high levels of customer loyalty. M-payments also help mobile network operators to increase their revenues, by developing new business models, and financial institutions to increase their customer bases.

With respect to technology used to connect a mobile devise to the others stakeholders technological infrastructure (i.e., banks, financial institutions, content providers, retailers), there are two main categories of m-payment systems (Gerpott and Meinert, 2017):

a   remote mobile payment systems (hereafter RMPS), enabling payments through mobile telecommunication or Wi-Fi networks

b   proximity mobile payment systems (hereafter PMPS) through short-range communication technologies (e.g., POS payments).

RMPS allow the payment for digital content or online purchases through SMS or mobile internet connection, while PMPS entails close distance between the mobile payment device and the device receiving it and, therefore, enables payments for purchases such as ticketing, vending, and point-of-sale items, employing a QR code displayed on the smartphone, or a near field communication (NFC) device or bluetooth low energy (BLE) proximity sensing technology (Gerpott and Meinert, 2017).

This study focuses on NFC-enabled PMPS (hereafter NFC-PMPS) that has become important part of consumers' shopping experience due to the continuous advancements of the technology and swelling usage of advanced mobile devices (Gerpott and Meinert, 2017). According to Transparency Market Research (2017), the global PMPS market was valued at \$57.9 bn in 2017. Exhibiting a 48% CAGR, the PMPS market is expected to rise to \$411.4 bn by 2022. NFC dominated the global PMPS market in 2017, accounting for 75.3% of the market and being valued at \$43.6 bn. The NFC segment of the global PMPS market is forecasted to present a 52.6% CAGR throughout the 2017–2022 period and rise to US\$360.9 bn. Following the trend, within 2017, Greece's major banks have established and developed PMPS services, all NFC technology-based.

Despite the promising figures concerning the PMPS market's overall future development, NFC-PMPS are developing only modestly (Gerpott and Meinert, 2017). Todate, PMPS in general and NFC-PMPS in particular is still a niche application. In Greece, PMPS has limited influence and had not become a mainstream part of Greek consumer culture so far. A significant factor that has hindered the full deployment of m-payments beginning this decade has been the severe financial crisis that the country is facing. However, the financial recession has leaded to the establishment of capital controls which limited the citizen's access to their financial deposits and cash withdrawals, and enacted legislature anticipating the mandatory installation of

m-payment terminals in every company within the country. These are expected to forcing the use of m-payment in the near future. Therefore, it is pivotal for NFC-PMPS providers to adequately identify the factors that will affect consumers towards adopting NFC-PMPS that, in turn, will allow them to develop marketing strategies that will increase its acceptance.

Previous studies investigating the adoption of PMPS around the world have used various extensions of the technology acceptance model (TAM) (Davis et al., 1989) to investigate the impact of consumers' beliefs about PMPS attributes on their *intention to use* the service (e.g., Leong et al., 2013; Shin and Lee, 2014; Dutot, 2015; Pal et al., 2015; Ooi and Tan, 2016; Ozturk, 2016; Luna et al., 2017; Liébana-Cabanillas et al., 2017). Other studies have used variations of the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al. (2003) to investigate the PMPS adoption process (Tang et al., 2014; Slade et al., 2015; Morosan and DeFranco, 2016; Khalilzadeh et al., 2017). Although, there are several models studying the adoption of NFC-PMPS, none of them have reached universal acceptance. Additional research is needed towards this end (Del Bosque and Crespo, 2011). In this context, an extension of the decomposed theory of planned behaviour (DTPB) is proposed to analyse the factors that determine consumers' intentions to adopt PMPS (Taylor and Todd, 1995; Tan and Teo, 2000; Del Bosque and Crespo, 2011). This particular model has not been used in the context of PMPS so far, although it includes three well-established theoretical innovation acceptance models: the theory of planned behaviour (TPB) (Ajzen, 1991), the TAM (Davis et al., 1989); and the innovation diffusion theory (IDT) (Rogers, 1995). Moreover, several previous studies empirically validate the superiority of the DTPB over the TAM, IDT and TPB in the context of information technology adoption/usage (e.g., Taylor and Todd, 1995; Lin, 2007; Huh et al., 2009).

Thus the objective of this paper is first, to empirically validate the appropriateness of an extended DTPB to explain the NFC-PMPS acceptance and second, to investigate the consumers' attitudinal, normative and behavioural control beliefs' structure in the specific context of NFC m-payment services. The study will be conducted on evidence from Greece.

The remainder of this paper is organised as follows. First, the literature on TPB, TAM and DTPB is reviewed with special attention to the studies in the fields of mobile services adoption in general and of NFC-PMPS adoption in particular. On the basis of the literature review, a series of research hypotheses reflecting the relationships among the constructs comprising the DTPB framework are proposed. Subsequently, the research methodology employed in this study and the results of the statistical analysis, used to investigate the research hypotheses, are presented. The theoretical and managerial implications, as well as the limitations of the study and directions for future research are finally discussed.

2   Literature review and innovation adoption models description

This section describes the DTPB and the TAM, IDT and TPB which it derives from. Moreover, previous studies in the fields of m-services adoption are presented.

2.1 Theory of planned behaviour

The TPB is an extension of the theory of reasoned action (TRA) (Fishbein and Ajzen, 1975), assuming that individuals' behaviour [i.e., actual usage (AU) of a technolog] is affected by their intention to perform the action (i.e., *intention to use* the technology), the latter being determined by their *attitude* and *subjective norms*. *Attitude* is defined as "an individual positive or negative feeling towards performing the target behaviour" [Taylor and Todd, (1995), p.149]. *Subjective norms* represent "the person's perception that most people who are important to him think he should or should not perform the behaviour in question" [Fishbein and Ajzen, (1975), p.302]. In the context of PMPS adoption, Attitude expresses consumers' predisposition or tendency to respond positively or negatively towards the use of PMPS, and *subjective norms* refers to consumers' perceptions regarding the opinions of a reference group towards the use of PMPS. The TPB, proposed by Ajzen (1991), extents the TRA to model conditions where individuals do not have complete control over their behaviour. For this reason an additional factor is proposed, called *perceived behavioural control*, to express individuals' perceptions about the internal and external constraints on behaviour. The impact of *attitude*, *subjective norms* and *perceived behavioural control* on potential customers' *intention to use* m-services has been empirically validated in many relevant studies in the fields (e.g., Pedersen, 2005; Mallat et al., 2009; Püschel et al., 2010; Slade et al., 2015; Luna et al., 2017; Liébana-Cabanillas et al., 2017).

2.2 TAM

Davis et al. (1989) proposed TAM to explain and predict the adoption and usage of information technology products and services. The development of TAM is also based on theory of reasoned action (TRA) (Fishbein and Ajzen, 1975) as it considers *attitude* as the main determinant of *intention to use*, while *attitude* is affected by customer's salient beliefs about the behaviour's consequences and desirability. TAM anticipates that customers' perceptions about the innovation's usefulness and easiness are the two beliefs determining *attitude* towards *intention to use*. According to Venkatesh and Davis (2000, p.187), *perceived usefulness* expresses the degree to which "a person believes that using the system will enhance his or her performance", and *perceived ease-of-use* the degree to which "a person believes that using the system will be free of effort." Additionally, Davis et al. (1989) found that *perceived usefulness* acts as a mediator since *perceived ease-of-use* influences *intention to use* primarily through *perceived usefulness*. Venkatesh and Davis (2000) introduced, at a later stage, TAM2 which does not consider *attitude* to be a mediating variable between *perceived usefulness*, *perceived ease-of-use* and *intention to use*. They suggest that the effect of *attitude* on *intention to use* decreases over time, while these of *perceived usefulness* and *perceived ease-of-use* on *intention to use* increase (Venkatesh and Davis, 2000). Both TAM and TAM2 have been extensively used and supported in research in the m-services acceptance context. Particularly, in the specific context of NFC-PMPS, Liébana-Cabanillas et al. (2017) and Luna et al. (2017) have taken TAM as reference to investigate the service acceptance in Spain and Brazil respectively. Both studies validated the effect of *perceived usefulness* on *attitude* and *perceived ease-of-use* on *perceived usefulness*, but failed to find a significant linkage between *perceived ease-of-use* and *attitude*, while only the second study have considered the effect of *perceived usefulness* on *intention to use*. Several other authors preferred the

TAM2 as a theoretical framework reference to investigate the NFC-PMPS adoption's determinants (e.g., Leong et al., 2013; Shin and Lee, 2014; Pal et al., 2015; Dutot, 2015; Ozturk, 2016; Ooi and Tan, 2016). While all studies have empirically validated the importance of *perceived usefulness* in explaining *intention to use* PMPS, most of them did not came to the same conclusion concerning *perceived ease-of-use*.

2.3   *DTPB and extensions*

Decomposed theory of planned behaviour (DTPB), proposed by Taylor and Todd (1995), integrates the TPB and TAM and at a lesser extend the IDT approaches to exploit the strengths of these theoretical acceptance models. Regarding the factors that directly affect *intention to use*, the TPB framework anticipates that potential customers' intentions to use a technology are determined by their *attitude* towards it, by the normative influence (*subjective norms*) that personal and non-personal sources exert to them and by their *perceived behavioural control*. These causal relationships have been empirically validated in the fields of PMPS (e.g.,Luna et al., 2017; Liébana-Cabanillas et al., 2017; Khalilzadeh et al., 2017), RMPS (Mallat et al., 2009; Shin, 2009; Schierz et al., 2010; Liébana-Cabanillas et al., 2013, 2014, 2015), e-commerce (Lin, 2007; Kim et al., 2009; Del Bosque and Crespo, 2011), e/m services (Bhattacherjee, 2000; Hsu and Chiu, 2004; Pedersen, 2005), e/m-banking (Tan and Teo, 2000; Püschel et al., 2010) and e-government (e.g., Al Athmay et al., 2016). Based on the above, the following hypotheses are proposed:

H_{1a} *Attitude* towards NFC-PMPS has a direct and positive effect on *intention to use*.

H_{1b} *Subjective norms* about NFC-PMPS has a direct and positive effect on *intention to use*.

H_{1c} *Perceived behavioural control* about NFC-PMPS has a direct and positive effect on *intention to use*.

DTPB extends the TPB by identifying the beliefs and factors that directly determine *attitude*, *subjective norms* and *perceived behavioural control* and, through these, *intention to use*. According to Taylor and Todd (1995), the attitudinal, normative, and behavioural control beliefs can be decomposed into multidimensional constructs. Based on the TAM (Davies et al., 1989), the IDT (Rogers, 1995) and the perceived risk theory (PRT) (Bauer, 1967), the DTPB decomposes *attitude* into four innovation's performance attributes: relative advantage, complexity, *compatibility* and *perceived risk* (Tan and Teo, 2000). Relative advantage expresses the degree to which a new technology provides more benefits than its predecessor. Economic benefits, efficiency, convenience, image enhancement and satisfaction are among the benefits that are considered by potential adopters towards evaluating the degree of an innovation's superiority (Tan and Teo, 2000). The complexity construct refers to the degree to which an innovation is perceived to be difficult to understand and use (Tan and Teo, 2000). Previous studies found that the relative advantage and complexity constructs are similar to *perceived usefulness* and *perceived ease-of-use* respectively and that TAM and IDT confirm each other's findings, which enhances confidence in the validity and reliability of these approaches (e.g., Lin, 2007). *Compatibility* refers to "the degree to which an innovation is perceived as being consistent with existing values, past experiences and needs of the potential adopter" [Rogers, (1995), p.223]. According to IDT (Rogers, 1995), the probability of innovation

adoption is positively related to the consistency of the innovation with potential adopters' value systems and procedures, while Slade et al. (2013) recognised *compatibility* among the pivotal drivers of mobile payment adoption. Finally, *perceived risk* was suggested, by Tan and Teo (2000), as an additional salient dimension in determining customers' *attitude* towards the use of an innovation. Consumer behaviour theory suggests that purchasing could be a risky process as it could end up with unexpected and unfavourable consequences (Bauer, 1967). The uncertainty of the occurrence of pleasant/unpleasant consequences from a buying decision can result in high *perceived risk*. This is related to the feelings of uncertainty or anxiety about the behaviour and the seriousness or importance of its possible negative outcomes (Featherman and Hajli, 2016). *Perceived risk* in the context of technology-based services reflects customers' potential loss in their pursuit to gain the benefits coming from service's usage. Previous studies suggest that when consumers evaluate a technology-based service, they develop beliefs about the technological service attributes and potential usage (e.g., Featherman and Hajli, 2016), which may include beliefs concerning service mal-performance and personal losses. These risk beliefs are used by consumers when they assess the usage risk of a new technology-based service, which is then affect their attitudes and intentions towards new service usage. Using PMPS, as is the case with other mobile services such as m-banking, involves risk because it may be related to negative consequences or losses not expected by the users (Yang et al., 2015). As people are inclined to avoiding risks rather than maximising utility when making a risky decision, *perceived risk* is considered among the key variables expected to determine PMPS potential adopters' behaviour (Yang et al., 2015). Moreover, Al Kailani and Kumar (2011) find that in high risk-averse societies, *perceived risk* associated with online purchasing is very high and negatively affects PMPS adoption. *perceived risk* in the mobile services context is generally conceptualised as a multidimensional construct. Most published studies in the m/e-services context adopt a five-dimensional measurement of *perceived risk* including (Yang et al., 2015): *financial risk*, expressing the potential adopters' perception about the possible loss of money, *privacy risk*, expressing potential loss of control over private information (i.e., phone number, passwords, consumption location, buying records, etc.); *performance risk*, expressing potential adopters' perception about the possibility of PMPS malfunctioning and delivering the services; *psychological risk*, reflecting the potential adopters' perception about possible losses of self-esteem, peace-of-mind or self-perception caused by the frustration, pressure, or anxiety resulting from the usage of PMPS; and *time risk*, referring to time losses (e.g., time to install and learn how to use the PMPS, time to learn the procedures in m-payment failures, etc.) due to the usage of PMPS. Based on Featherman and Hajli (2016), these types of risk beliefs will be used in this study as the basis for potential adopters' evaluation of PMPS usage risk. A second-order construct is used for *perceived risk* operationalisation having the aforementioned five risk facets as its first-order sub-dimensions. This approach is supported by Featherman and Hajli (2016) and Roy et al. (2017) claiming that the five *perceived risk* sub-dimensions are closely related and covary leading to the conclusion that *perceived risk* can be measured as a second-order reflectively measured construct.

The influence of *perceived usefulness* and *perceived ease-of-use* on *attitude* towards *intention to use* PMPS has been supported by previous studies despite some contradictory evidence. The studies of Luna et al. (2017) and Liébana-Cabanillas et al. (2015, 2017) validated the effect of *perceived usefulness* on *attitude* but failed to find a significant

linkage between *perceived ease-of-use* and *attitude*. However, other RMPS related studies (e.g., Liébana-Cabanillas et al., 2013, 2014; Muñoz-Leiva et al., 2017) and studies in m-banking (Hsu et al., 2011; Püschel et al., 2010) have confirmed the positive impact of both *perceived ease-of-use* and *perceived usefulness* on *attitude*. As far as the effect of *compatibility* on *attitude* is concerned, there is empirical evidence that potential customers perceiving an innovation as being consistent with their existing values, past experiences and needs, formulate a positive *attitude* towards it. The study of Luna et al. (2017) validated the positive effect of potential customers' *compatibility* on the *attitude* towards NFC-PMPS, while the study of Liébana-Cabanillas et al. (2015) failed to validate this effect. However, other authors in the fields of technology-based services' adoption conclude that when the service meets customers' values and past experience, they tend to formulate a more positive *attitude* toward the service (e.g., Taylor and Todd, 1995; Tan and Teo, 2000; Püschel et al., 2010; Del Bosque and Crespo, 2011; Lin, 2007). With regards to the role of *perceived risk* on *attitude*, there are no previous studies investigating this particular relation in relation to PMPS adoption. However, the literature on RMPS (Liébana-Cabanillas et al., 2013, 2014, 2015) and e/m-banking (e.g., Tan and Teo, 2000; Lin, 2007; Roy et al., 2017) provide strong empirical evidence about the negative effect of *perceived risk* on potential customers' *attitude*. Following the preceding findings the following hypotheses are proposed:

H_{2a} *Perceived usefulness* in using NFC-PMPS has a direct and positive effect on *attitude* towards this behaviour.

H_{2b} *Perceived ease-of-use* in using NFC-PMPS has a direct and positive effect on *attitude* towards this behaviour.

H_{2c} *Compatibility* in using NFC-PMPS has a direct and positive effect on *attitude* towards this behaviour.

H_{2e} *Perceived risk* in using NFC-PMPS has a direct and negative effect on *attitude* towards this behaviour.

As far as the normative beliefs structure is concerned, previous studies consider personal and environmental influences as antecedents of *subjective norms* (Taylor and Todd, 1995; Bhattacherjee, 2000; Lin, 2007). This is based on the IDT (Rogers, 1995), which postulates that potential customers of an innovation will attribute credibility to personal and non-personal information coming from primary and secondary reference groups (Del Bosque and Crespo, 2011). Bhattacherjee (2000), Lin (2007) and Pedersen (2005) consider *interpersonal influence* and *external influence* as the two main determinants of *subjective norms*. *Interpersonal influence* reflect the influence of friends, colleagues, and superiors through word-of-mouth communication, and *external influence* includes mass media reports, opinion leaders' suggestions, and other information transmitted by non-personal sources. These leads to proposing the following hypotheses:

H_{3a} *Interpersonal influence* in using PMPS has a direct and positive effect on *subjective norms.*

H_{3b} *External influence* in using PMPS has a direct and positive effect on *subjective norms.*

The decomposition of *perceived behavioural control* includes two constructs expressing *self-efficacy* and *facilitating conditions*. *Self-efficacy* refers to potential users perceptions

about their capabilities to use the innovation and *facilitating conditions* reflects the availability of the necessary resources to perform particular behaviours (Taylor and Todd, 1995). Several previous studies consider both variables as defining components of *perceived behavioural control* and observe that their effect on the acceptance of m/e-services was very significant (e.g., Tan and Teo, 2000; Bhattacherjee, 2000; Lin, 2007; Püschel et al., 2010; Del Bosque and Crespo, 2011). In line with these studies, the following are proposed:

H$_{4a}$ *Self-efficacy* in using NFC-PMPS has a direct and positive effect on *perceived behavioural control.*

H$_{4b}$ *Facilitating conditions* in using NFC-PMPS has a direct and positive effect on *perceived behavioural control.*

While the originally formulated DTPB has proven its superiority over other theoretical models in explaining innovation acceptance (e.g., Lin, 2007; Huh et al., 2009), previous studies in the field of technology-based services adoption support some extra relationships between the TRB beliefs and their antecedents that are not incorporated into the originally formulated DTPB and could extend the utility of this modelling framework (Pedersen, 2005).

     The present study attempts to extend the DTPB accordingly in the field of NFC-PMPS. By considering the TAM framework, potential customers' *intention to use* a technology-based service is also influenced by their beliefs about the *perceived usefulness* of that service which, in turn, is affected by *perceived ease-of-use* (Davis et al., 1989). While empirical evidence obtained from previous studies in the field of e/m-commerce in general and of PMPS and RMPS in particular supports the positive influence of *perceived ease-of-use* on *perceived usefulness* (e.g., Dutot, 2015; Luna et al., 2017; Liébana-Cabanillas et al., 2017; Muñoz-Leiva et al., 2017; Ozturk, 2016), results about the relationship between *perceived usefulness* and *intention to use* in the presence of *attitude* are somehow contradicting. Several studies failed to empirically validate the partial mediation of *attitude* in the *perceived usefulness – intention to use* link and, therefore, to support the *perceived usefulness – intention to use* direct link (e.g., Schierz et al., 2010; Muñoz-Leiva et al., 2017; Püschel et al., 2010; Luna et al., 2017), while other studies provided empirical evidence that *perceived usefulness* along with *attitude* affect *intention to use* (e.g., Del Bosque and Crespo, 2011; Hsu et al., 2011; Liébana-Cabanillas et al., 2017;). On the other hand, many previous studies in the field of PMPS applied the TAM2 framework to explain PMPS adoption process. The direct effect of *perceived usefulness* on *intention to use* was empirically validated in all these studies (e.g., Leong et al., 2013; Shin and Lee, 2014; Tan et al., 2014; Dutot, 2015; Pham and Ho, 2015; Ozturk, 2016; Ooi and Tan, 2016; Su et al., 2017).

     Moreover, IDT studies suggest that individuals who feel compatible with a new technology (i.e., m/e-banking) are in a better position to evaluate the usefulness of the new technology (Rogers, 1995). Such studies, intergraded *compatibility* into the TAM and proposed a direct impact of *compatibility* on *perceived usefulness* in addition to that on *attitude* (e.g., Schierz et al., 2010; Oliveira et al., 2016).

     Following the above discussion the following hypotheses is proposed:

H$_5$ *Perceived usefulness* in using NFC-PMPS has a direct and positive effect on *intention to use* the service.

H_6 *Perceived Ease-of-Use* in using NFC-PMPS has a direct and positive effect on *perceived usefulness* of this behaviour.

H_7 *Compatibility* in using NFC-PMPS has a direct and positive effect on *perceived usefulness* of this behaviour.

In the context of PMPS, the risks associated with this technology-based service may also negatively influence potential customers' belief about its *perceived usefulness* and decrease their *intention to use* the service. Findings from various m-commerce contexts suggest that customers' willingness to use a new m-service becomes stronger whenever they perceive lower purchasing risks (e.g., Yang et al., 2015; Featherman and Hajli, 2016; Muñoz-Leiva et al., 2017). There are no many studies specifically investigating the role of *perceived risk* in the m-payment/banking context. Pham and Ho (2015), Slade et al. (2015) and Su et al. (2017) empirically validated the negative direct effect of *perceived risk* on *intention to use*, while Tan et al. (2014), and Roy et al. (2017) failed to do so. Finally Ozturk (2016) integrated *perceived risk* into the TAM and found that it directly affects both *perceived usefulness* and *intention to use*. Based on the theoretical and empirical support from the literature, the following hypotheses are developed.

H_8 *Perceived risk* in using NFC-PMPS has a direct and negative effect on *perceived usefulness* of this behaviour.

H_9 *Perceived risk* in using NFC-PMPS has a direct and negative effect on *intention to use* the service.

Drawing on the so-called internalisation mechanisms, Venkatesh and Davis (2000) suggested the direct impact of *subjective norms* on *attitude* except of that of *subjective norms* on *intention to use*. Relevant empirical studies provide evidence that if a peer or an industry expert or a media report suggest that a service might be good, a potential adopter may tend to form a positive *attitude* towards it before they express intentions to use it (Kim et al., 2009). The importance of *subjective norms* on *attitude* formation increases for services that are in the early stages of the diffusion process where the potential adopters lack reliable usage information about them. In the field of technology-based services adoption, previous studies have shown that *subjective norms* influence *attitude* toward a specific behaviour (e.g., Pedersen, 2005; Kim et al., 2009; Schierz et al., 2010; Del Bosque and Crespo, 2011). Moreover, based on the theory of fashion, Pedersen (2005) suggested and empirically validated the impact of *subjective norms* determinants on *perceived usefulness*, as users' beliefs about the usefulness of a new technology-based service were communicated through media and social networks and they are used by potential customers to form their expectations. Finally, Khalilzadeh et al. (2017) and Dutot (2015) found that as the number of the users of the NFC-PMPS increases in the society, the *perceived usefulness* of the service will also increase. Hence, social context's support to the usage of a technology plays an important role in the adoption decision process leading to the following hypothesis:

H_{10} *Subjective norms* about NFC-PMPS use has a direct and positive effect on *attitude* towards this behaviour.

H_{11} *Interpersonal influence* to using NFC-PMPS has a direct and positive effect on *perceived usefulness* of this behaviour.

H$_{12}$ *External influence* to using NFC-PMPS has a direct and positive effect on *perceived usefulness* of this behaviour.

Based on these research hypotheses, the proposed model, that aims to study the process of PMPS adoption, is illustrated in Figure 1.

Figure 1   Extended DTPB model
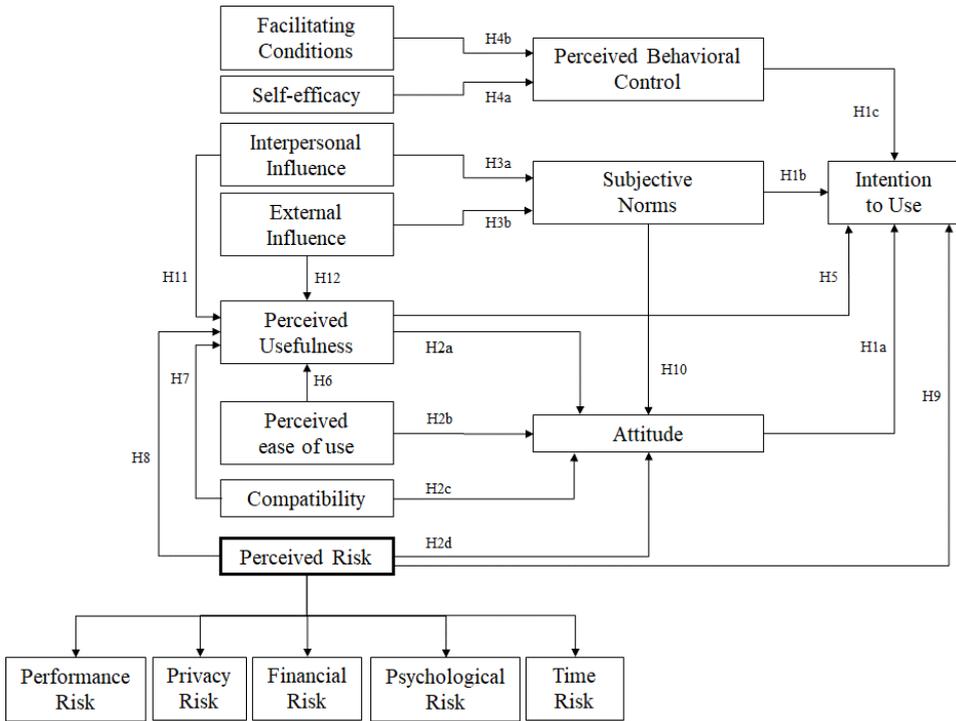
3   Research methodology

3.1   Measures

To ensure the content validity of the scales used to measure the constructs of the four models, validated scale items from prior studies were used and their sources are given in Table 1. The questionnaire also included a filter question to detect the awareness of PMPS in Greece, since the technology is new. Following the procedure of Luna et al. (2017), all individuals who responded that are not awarded about the service or heard of, but do not know how it works, were invited to view a video in YouTube explaining the NFC-PMPS features. All scale items were measured using a 7-point Likert scale with 1 corresponding to 'strongly disagree' and 7 to 'strongly agree'. In order to maintain the technical and conceptual equivalence of the scales, a translation and back-translation strategy was applied during the development of the Greek version of the questionnaire. Finally, a scales' reliability analysis was performed on the data collected from the pilot

study. The results were satisfactory, given that Cronbach's alpha values for all scales were well above the commonly accepted threshold value of 0.70.

Table 1   Measurement scales' sources

Construct	Source
Perceived usefulness	Bhattacherjee (2001), Schierz et al. (2010)
Perceived ease-of-use	Davis et al.(1989), Taylor and Todd (1995), Schierz et al. (2010)
Compatibility	Tan and Teo (2000); Schierz et al. (2010)
Attitude	Schierz et al. (2010)
Interpersonal influence	Lin (2007)
External influence	
Subjective norms	
Self-efficacy	Taylor and Todd (1995)
Facilitating conditions	
Perceived behavioural control	
Financial risk	Yang et al. (2015)
Privacy risk	
Performance risk	
Psychological risk	
Time risk	
Intention to use	Venkatesh and Davis (2000), Schierz et al. (2010)

3.2   Data collection

Survey participants of the study were 18+ years old, mobile telephony users living in Athens, the capital of Greece, where about 50% of the total Greek population is residing. This choice was made for two reasons. First because the number of adopters is very small and very difficult to identify, and second it is of interest to study the factors affecting the acceptance of NFC-PMBS at the early stages of the PLC where most people are not fully aware of the benefits and the risks of the new service (Luna et al., 2017). Given the difficulty in obtaining a comprehensive sample and the limited research resources, a mall-intercept procedure (i.e., a non-probabilistic sample) was considered to be an appropriate method for collecting primary data. The fieldwork was carried out by 15 trained and supervised senior students. Six hundred (600) questionnaires were distributed in malls located in three different areas of Athens with different socioeconomic profiles. Contacts were made at different times of the day and days of the week in order for day and time related bias to be eliminated. This procedure resulted in 530 questionnaires. After eliminating those with unanswered items 513 questionnaires were coded for data analysis.

3.3   Data analysis method

The method of partial least squares (PLS), an implementation of structural equation modeling (SEM) with Smart PLS 2.0 M3 (Ringle et al., 2005), was preferred over

covariance-based SEM, to examine the model and test the proposed hypotheses (Hair et al., 2011). PLS-SEM is a suitable technique for prediction-oriented research because its objective is to maximise the explained variance of the dependent constructs (Hair et al., 2011) and it has the advantage of not holding the distributional assumption of normality, making less demand on measurement scales, being able to work with much smaller as well as much larger samples (Hair et al., 2011).

4 Results

4.1 Sample profile

As shown in Table 2, among the 513 respondents, 59% were females. In terms of age, 30% of respondents are in the 18–24 age-group, 31% in the 25–34 age-group, 19% in the 35–44 age-group, and 20% are older than 45 years. In terms of educational level, 40% of respondents have secondary school qualification or less, 49% hold a graduate/college degree and 11% hold a postgraduate degree. Finally, 55 % were not awarded about the PMPS options.

Table 2 Sample profile

Characteristic	Frequency (N = 513)	%
Gender		
Male	303	59%
Female	210	41%
Age		
18–24	152	30%
25–34	157	31%
35–44	98	19%
45+	106	20%
Education		
High school or below	205	40%
University/college degree	251	49%
Postgraduate degree	57	11%
Awareness of NFC MB		
Yes	282	51%
No	231	49%

4.2 Measurement model assessment

The test of the measurement model for first-order constructs involves, firstly, the estimation of reliability; convergent validity, and discriminant validity of the extended DTPB' first-order constructs, indicating the strength of measures used to test the proposed model (Hair et al., 2011). The reliability of all constructs was examined using the Cronbach's alpha (CA) and Composite Reliability (CR) measures. Hair et al. (2011) suggest that a value of 0.70 provide adequate evidence for internal consistency. As shown

in Table 3, CA and CR values of all measures included in the study exceed 0.79 and 0.88 respectively suggesting that all measures were good indicators of their respective components. The average variance extracted (AVE), indicating the amount of variance captured by the construct in relation to the variance due to measurement error, was used to assess convergent validity. As depicted in Table 3, AVE values for all constructs exceed 0.65, higher than the recommended cut-off value of 0.50 (Hair et al., 2011) suggesting satisfactory convergent validity.

Table 3   Measurement model assessment (first-order constructs)

Latent variable	Item	MV	SD	Loadings	Critical ratio	CA	CR	AVE
Performance risk	PER1	4.88	1.59	0.93	112.72	0.90	0.94	0.84
	PER2	4.86	1.59	0.94	130.79			
	PER3	3.98	1.57	0.89	72.26			
Privacy risk	PRR1	4.96	1.80	0.89	71.49	0.89	0.93	0.82
	PRR2	5.25	1.78	0.92	91.72			
	PRR3	4.99	1.82	0.91	81.05			
Financial risk	FIR1	4.71	1.75	0.91	85.16	0.91	0.94	0.84
	FIR2	4.33	1.78	0.92	125.55			
	FIR3	4.00	1.67	0.93	134.01			
Psychological risk	PSR1	3.10	1.80	0.88	66.26	0.85	0.91	0.77
	PSR2	3.35	1.86	0.91	105.21			
	PSR3	3.99	1.87	0.83	44.32			
Time risk	TIR1	4.06	1.72	0.96	311.37	0.87	0.92	0.79
	TIR2	4.04	1.95	0.86	58.61			
	TIR3	4.08	1.94	0.85	58.16			
Perceived ease-of-use	PEOU1	6.05	1.17	0.86	56.72	0.82	0.88	0.65
	PEOU2	5.87	1.26	0.88	82.28			
	PEOU3	5.49	1.21	0.75	22.55			
	PEOU4	5.40	1.27	0.73	22.28			
Perceived usefulness	PU1	5.33	1.32	0.86	62.31	0.84	0.90	0.68
	PU2	5.62	1.31	0.79	33.68			
	PU3	5.40	1.45	0.80	37.53			
	PU4	5.04	1.39	0.85	54.78			
Compatibility	COMP1	4.30	1.65	0.86	61.63	0.88	0.92	0.74
	COMP2	4.57	1.58	0.88	70.78			
	COMP3	5.09	1.43	0.84	51.34			
	COMP4	4.90	1.64	0.86	62.98			
Attitude	ATT1	5.25	1.53	0.89	89.15	0.91	0.94	0.79
	ATT2	5.79	1.30	0.89	60.67			
	ATT3	5.66	1.36	0.91	87.61			
	ATT4	5.60	1.43	0.87	44.94			

Notes: Composite reliability (CR), Cronbach's alpha (CA), average variance extracted (AVE), mean value (MV) and std. deviation (SD).

Table 3 Measurement model assessment (first-order constructs) (continued)

Latent variable	Item	MV	SD	Loadings	Critical ratio	CA	CR	AVE
Interpersonal influence	IPI1	4.48	1.69	0.94	233.18	0.93	0.95	0.87
	IPI2	4.01	1.89	0.94	215.05			
	IPI3	3.93	1.91	0.91	118.38			
External influence	EXI1	4.82	1.71	0.93	144.06	0.89	0.93	0.81
	EXI2	4.67	1.90	0.91	100.18			
	EXI3	4.83	1.89	0.87	64.43			
Subjective norms	SN1	5.34	1.39	0.85	51.79	0.83	0.90	0.75
	SN2	4.50	1.70	0.85	55.34			
	SN3	4.98	1.51	0.89	65.73			
Self-efficacy	SEF1	6.04	1.32	0.90	71.71	0.90	0.94	0.83
	SEF2	5.92	1.44	0.93	89.70			
	SEF3	5.70	1.62	0.91	83.88			
Facility conditions	FC1	6.21	1.29	0.87	54.29	0.79	0.88	0.69
	FC2	6.18	1.28	0.81	24.12			
	FC3	6.31	1.18	0.82	26.83			
Perceived behavioural control	PBC1	6.47	0.94	0.80	30.50	0.82	0.89	0.74
	PBC2	6.01	1.39	0.88	52.43			
	PBC3	6.17	1.27	0.89	74.65			
Intention to use	BINT1	5.71	1.59	0.94	101.33	0.96	0.97	0.89
	BINT2	5.74	1.61	0.93	85.82			
	BINT3	5.49	1.73	0.94	117.25			
	BINT4	5.53	1.67	0.95	116.30			

Notes: Composite reliability (CR), Cronbach's alpha (CA), average variance extracted (AVE), mean value (MV) and std. deviation (SD).

Discriminant validity was assessed by comparing the square root of AVE extracted from each construct with the correlations among constructs. The findings provide strong evidence of discriminant validity among all first order constructs. As seen in Table 4, the square roots of AVE for all first-order constructs are higher than their shared variances (Hair et al., 2011).

The *perceived risk* construct is modelled as a reflective second-order construct. A commonly used method of approximating second-order factors is the repeated indicator approach, where the second order factor is directly measured by using items of all its lower order factors (Wetzels et al., 2009). The procedure performs better when the lower order constructs have about equal number of items. CR and AVE measures of *perceived risk* are used to assess higher order's reliability. As shown in Table 5, CR and AVE for *perceived risk* are 0.94 and 0.52 respectively, both above the recommended thresholds of 0.70 and 0.50, respectively, providing evidence of a reliable second-order construct (Wetzels et al., 2009). Finally, all loadings of the second-order constructs on the first-order constructs exceed 0.69 and are significant at p = 0.001. All the above suggest that *perceived risk* reflects customers' perception of their five pre-specified sub-dimensions.

Table 4   Discriminant validity assessment (first-order constructs)

Latent variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Performance risk	**0.92**															
2 Privacy risk	0.56	**0.91**														
3 Financial risk	0.68	0.66	**0.92**													
4 Psychological risk	0.59	0.53	0.58	**0.87**												
5 Time risk	0.49	0.36	0.44	0.56	**0.89**											
6 Perceived ease-of-use	−0.26	−0.26	−0.27	−0.39	−0.22	**0.81**										
7 Perceived usefulness	−0.33	−0.34	−0.34	−0.42	−0.23	0.44	**0.83**									
8 Compatibility	−0.36	−0.39	−0.36	−0.49	−0.25	0.51	0.60	**0.86**								
9 Attitude	−0.40	−0.35	−0.38	−0.49	−0.28	0.49	0.60	0.63	**0.89**							
10 Interpersonal influence	−0.18	−0.18	−0.21	−0.24	−0.10	0.22	0.29	0.29	0.33	**0.93**						
11 External influence	−0.24	−0.24	−0.28	−0.31	−0.16	0.26	0.33	0.36	0.41	0.46	**0.90**					
12 Subjective norms	−0.30	−0.32	−0.35	−0.42	−0.21	0.38	0.47	0.48	0.56	0.60	0.70	**0.87**				
13 Facilitating conditions	−0.15	−0.16	−0.15	−0.25	−0.13	0.36	0.24	0.27	0.31	0.20	0.20	0.30	**0.83**			
14 Self-efficacy	−0.26	−0.26	−0.24	−0.37	−0.23	0.50	0.26	0.36	0.37	0.20	0.25	0.34	0.53	**0.91**		
15 Perceived behavioural control	−0.23	−0.23	−0.25	−0.37	−0.23	0.46	0.28	0.33	0.40	0.21	0.24	0.34	0.70	0.70	**0.86**	
16 Intention to use	−0.40	−0.42	−0.42	−0.53	−0.32	0.43	0.55	0.56	0.68	0.31	0.38	0.53	0.33	0.38	0.43	**0.94**

Table 5 Perceived risk measurement assessment

| Sub-dimension | *Perceived risk (CR = 0.94 AVE = 0.52)* | | | |
	Loadings	*Critical ratio*	*95%CI*	R^2
Performance risk	0.84	47.30	[0.81–0.87]	0.71
Privacy risk	0.79	38.88	[0.74–0.83]	0.62
Financial risk	0.85	49.87	[0.82–0.88]	0.73
Psychological risk	0.82	43.11	[0.78–0.85]	0.67
Time risk	0.69	28.56	[0.62–0.73]	0.47

4.3 Hypotheses testing and structural model assessment

The PLS-PM method was also used to confirm the hypothesised relationships between constructs in the proposed model. The significance of the paths included into the proposed model was tested using a bootstrap resample procedure. In assessing the PLS model, the squared multiple correlations (R^2) for each endogenous latent variable were initially examined and the significance of the structural paths was evaluated. The proposed relationships are considered to be supported if the corresponding path coefficients have the proposed sign and are significant. As shown in Figure 2, all model's path coefficients are statistically significant.

Figure 2 Structural model results
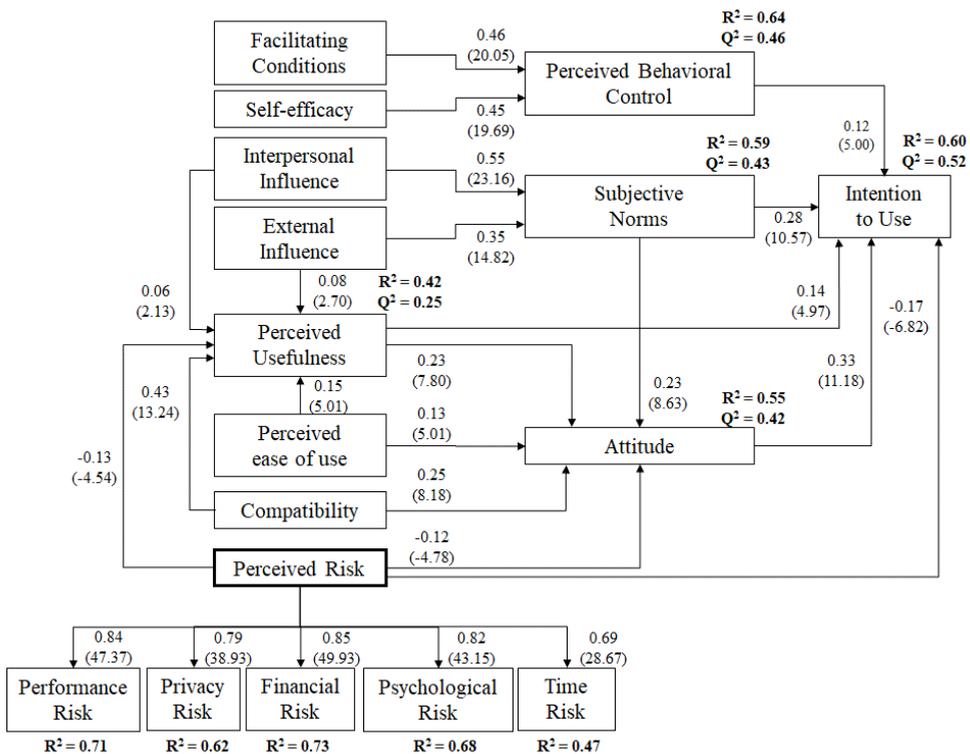
Note: t-stat in parenthesis.

As far as the part of the model, representing the TPB, is concerned, the results allow for the verification of the positive effects of *attitude* ($\beta = 0.33$; $t = 11.18$), *subjective norms* ($\beta = 0.28$; $t = 10.57$) and *perceived behavioural control* ($\beta = 0.12$; $t = 5.00$) on *intention to use*, as well as the positive effect of *subjective norms* ($\beta = 0.23$; $t = 8.63$) on *attitude*. H_{1a}, H_{1b}, H_{1c} and H_{10} are, therefore, supported. With regards to the influence of NFC-PMPS performance attributes on *intention to use*, the obtained empirical evidence supports the effects of *perceived usefulness* ($\beta = 0.14$; $t = 4.97$) and *perceived risk* ($\beta = -0.17$; $t = -6.82$) on *intention to use*, meaning that H_5 and H_9 are confirmed. As far as the *attitude* determination about using NFC-PMPS is concerned, the results indicated that, among NFC-PMPS attributes, *compatibility* ($\beta = 0.25$; $t = 8.18$) and *perceived usefulness* ($\beta = 0.23$; $t = 7.80$) play the most important role followed by *perceived ease-of-use* ($\beta = 0.13$; $t = 5.01$) and *perceived risk* ($\beta = -0.12$; $t = -4.78$). Hence, H_{2a}, H_{2b}, H_{2c} and H_{2d} are therefore supported. From the interrelationships among potential customers' beliefs about NFC-PMPS attributes and the social framework determinants, results support the positive influence of *compatibility* ($\beta = 0.43$; $t = 13.24$), *perceived ease-of-use* ($\beta = 0.15$; $t = 5.01$), *external influence* ($\beta = 0.08$; $t = 2.70$) and *interpersonal influence* ($\beta = 0.06$; $t = 2.13$) and the negative influence of *perceived risk* ($\beta = -0.13$; $t = -4.54$) on *perceived usefulness*. These mean that H_6, H_7, H_8, H_{11}, and H_{12} are supported. Regarding the customers' beliefs about *subjective norms* formation, *interpersonal influence* ($\beta = 0.55$; $t = 23.16$) is its most important determinant, followed by *external influence* ($\beta = 0.35$; $t = 14.82$), meaning that both H_{3a} and H_{3b} are fully supported. Finally, potential customers' beliefs about their control over NFC PMPS usage is equally formed by *facilitating conditions* ($\beta = 0.46$; $t = 20.05$) and *self-efficacy* ($\beta = 0.45$; $t = 19.69$) providing solid evidence about the validity of both H_{4a} and H_{4b}.

The goodness-of-fit (GoF) and the relative GoF statistics, representing indices bounded between 0 and 1, are used for PLS model global validation. The relevant values for the proposed model are 0.67 and 0.97 respectively, indicating that the findings adequately validate the PLS model globally (Hair et al., 2011). The extended DTPB also demonstrates a high level of predictive power (R^2) because the model's constructs explain 42% of variance in *perceived usefulness*, 64% of variance in *perceived behavioural control*, 59% of variance in *subjective norms*, 55% of variance in *attitude* and 60% of variance in *intention to use*. Finally, as shown in Table 2, the blindfolding results of Q^2 for all endogenous constructs are greater than 0.25 for all endogenous variables, confirming the model's high predictive relevance as Q^2 value for all model's endogenous variables are greater than zero (Hair et al., 2011).

5   Discussion and implications

The purpose of this study was to investigate the factors affecting consumers' behavioural intentions to use NFC-PMPS in Greece. An extended version of the DTPB was used as theoretical framework reference. The theoretical contributions of the study are three fold. Firstly, this is the first empirical study in the field of NFC-PMPS adoption process that implements the DTPB extension. The proposed model integrates TPB, TAM, and IDT to describe the effects of the attitudinal, normative and control beliefs that potential consumers have about the use of this new technology-based service. This model exploit the strengths of all three theoretical acceptance models and also details the

aforementioned consumers' beliefs providing a better way to understand the new technology adoption process (Del Bosque and Crespo, 2011). Second, an integrated measure of *perceived risk*, reflecting five risk facets of the NFC-PMPS, was included in the model to represent the fear that consumers have when it comes to using new technologies and to further investigate the effect that *perceived risk* has on their perception about the rational technology-based service's attributes (*perceived usefulness*), their *attitude* towards it as well as their intentions to use it. Third, a more detailed structure of the interrelationships among the attitudinal and normative beliefs and their determinants is proposed to consider their indirect and direct effects on consumers' *intention to use* the NFC-PMPS.

The findings of this research have a number of important implications for both researchers and practitioners. Since the proposed model has not been used in the NFC-PMPS context so far, it could be used to provide the theoretical foundation for researchers to build on it, leading to a better understanding of the customer's acceptance process of this m-service. On the other hand, the understanding of the key elements in the proposed model will help firms in the development and commercialisation of NFC-PMPS, so as to achieve high consumer acceptance.

5.1 *Theoretical implications*

From a theoretical point of view, the findings indicate that, in accordance with the studies of Liébana-Cabanillas et al. (2015, 2017), Luna et al. (2017) and Khalilzadeh et al. (2017), *attitude* and *subjective norms* have the strongest impact on potential customers' intentions to use NFC-PMPS followed by *perceived behavioural control*. As such, potential customers who favourably value (both cognitively and affectively) the consequences of NFC-PMPS usage are, to some extent, predisposed to use the service. Moreover, the enhancement effect of *attitude* on the relation between *subjective norms* and *intention to use* indicated the influence coming from the consumers' social environment improves their perception about the rational and affective advantages of the NFC-PMPS, and further increase their willingness to use it (Schierz et al., 2010; Del Bosque and Crespo, 2011; Tan et al., 2014; Luna et al., 2017).

The high uncertainty associated with the NFC-PMPS usage may lead potential customers to conduct a superficial rational service attributes' evaluation and rely more on the suggestions of existing customers and mass media communications to decide to adopt or reject the service (Bhattacherjee, 2000).

Regarding, the influence of *perceived behavioural control* on *intention to use*, although significant, is very small compared to *attitude* and *subjective norms*. This can be attributed to the high penetration of mobile devices and their extensive use in everyday life activities which enhance potential consumers' control over using m-services in general, resulting in higher levels of knowledge, resources, and opportunities availability necessary for using the service (Bhattacherjee, 2000; Tan and Teo, 2000).

Based on the TAM and PRT and in accordance with previous studies in the field, except of the three TBP beliefs, two NFC-PMPS performance attributes concerning its usefulness (*perceived usefulness*) and level of riskiness (*perceived risk*), significantly also affect consumers' intentions to use the service along with consumers *attitude* towards this behaviour (e.g., Schierz et al., 2010; Del Bosque and Crespo, 2011; Slade et al., 2015; Liébana-Cabanillas et al., 2017; Ozturk, 2016), pointing out the significance of these two

utilitarian and rational elements in the adoption decision making process (Del Bosque and Crespo, 2011).

Meanwhile, the DTPB framework identified four NFC-PMPS attributes (*perceived usefulness*, *perceived ease-of-use*, *compatibility*, and *perceived risk*) as significant determinants of *attitude* towards using the service. Thus, potential consumers who feel that NFC-PMPS is compatible with their needs, values and previous experience, and perceive that NFC-PMPS to be better, easier and less risky to pay their bills than using cash or credit cards, express high willingness in using the service (e.g., Liébana-Cabanillas et al., 2015; 2017; Schierz et al., 2010). Regarding the normative beliefs' determination, *interpersonal influence* found to be more significant than *external influence*. This means that, as in other m-services contexts, consumers' willingness to accept NFC-PMPS is determined firstly by innovators' and early adopters' prior experiences and secondly by non-personal sources such as opinions of industry experts and mass media communication (Lin, 2007; Del Bosque and Crespo, 2011). However, the latter could be of particular importance in enhancing customers' awareness and trial in the early stages of service life cycle (Bhattacherjee, 2000; Lin, 2007).

As per the factors shaping consumers' *perceived behavioural control* beliefs in using NFC-PMPS, both *facilitating conditions* and *self-efficacy* appeared to be equally important, a result that was also found in the study of Pedersen (2005). Finally, it is worth highlighting the nodal role of NFC-PMPS *perceived usefulness* in relation to its other three performance attributes perception (i.e., *perceived ease-of-use*, *compatibility*, *perceived risk*) and the social norms determinants (Liébana-Cabanillas et al., 2017).

Finally, in accordance with Pedersen (2005) and Del Bosque and Crespo (2011), consumers' expectations about the NFC-PMPS utilitarian benefits (*perceived usefulness*) are shaped by:

1   internal sources related to perceived service's *compatibility*, easiness and level of riskiness

2   external sources related to their information disseminated by their interpersonal and non-personal social context. These expectations are then used by consumers to shape, to some extent, their willingness to use NFC-PMPS.

5.2   *Practical implications*

From a practical point of view, the comprehension of the factors affecting consumers' willingness to use NFC-PMPS would be extremely useful for establishing marketing strategies aiming to increase service penetration. In this sense, NFC-PMPS providers have to ensure that their potential consumers have a favourable *attitude* towards this services and worth to take the risk to use it. As overall *attitude* towards NFC-PMPS is influenced by certain performance/utilitarian aspects of the service and in particular by its *compatibility*, usefulness and easiness, the firms should communicate to potential consumers, which feel that NFC-PMPS is compatible with their life style, the advantages that the service has in comparison to other payment options and deliver simply/friendly interfaces to facilitate the service usage. On the other hand, they have to offer and communicate guaranties to reduce potential consumers' perception of usage risk and in turn increase both their *attitude* and willingness towards using it (Ozturk, 2016). Regarding consumers' reliance on their personal and non-personal social context, firms have to communicate through mass media positive testimonials of satisfied adopters that

will increase potential consumers' awareness/trial, and educate them. They have, further, to design appropriate below-the-line campaigns (social media campaigns; phone-call-campaigns; SMS campaigns) aiming to subsidy existing users with positive experiences who will bring new consumers through positive word-of mouth.

6   Limitation and further research

This study, despite the significance of its findings, has a number of limitations that narrow its scope. First, it follows a hybrid convenient sampling strategy that does not ensure the full generalisation of the results. The proposed model can be used for further research using a random sampling approach, resulting to a more representative sample which will allow the extraction of more trustworthy results. Second, the fact that the study was conducted in Athens, may affect the results and the generalisation of the results may not be widely acceptable. There are different territories in Greece exhibiting different problems, like remote areas without reliable mobile connections, which might not be appropriate the deployment of NFC PMPS options. Third, the findings and the implications of this research were obtained using a cross-sectional study. This reduces the ability of the study to reflect the temporal changes in the research constructs. A longitudinal study on the subject is necessary in order to clarify the effects of temporal changes. Furthermore, due to the globalisation of services, it is important to test the model across various countries with different cultures, to identify differences or similarities due to culture. Finally, although the extended DTPB provide a multitude of attitudinal, normative and control factors that affect NFC-PMPS adoption, the integration of personal characteristics, such as consumer innovativeness, mobility, prior experience, need for control, novelty seeking and customer demographics (Heidenreich and Handrich, 2015), and their relationships with other models' belief constructs is expected to provide more tools to better understand the adoption process and enable marketing professionals of NFC-PMPS firms to contact more effectively their potential consumers.

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