

Article

Mobile Payment Adoption in the Age of Digital Transformation: The Case of Apple Pay

Francisco Liébana-Cabanillas ¹, Inmaculada García-Maroto ¹, Francisco Muñoz-Leiva ¹
and Iviane Ramos-de-Luna ^{2,*}

¹ Department of Marketing and Market Research, University of Granada, 18010 Granada, Spain; franlieb@ugr.es (F.L.-C.); inmagem@ugr.es (I.G.-M.); franml@ugr.es (F.M.-L.)

² Faculty of Economics and Business, Open University of Catalonia, 08018 Barcelona, Spain

* Correspondence: iramosde@uoc.edu

Received: 29 May 2020; Accepted: 3 July 2020; Published: 6 July 2020



Abstract: Current developments in information technology and communications, as well as the significant transformations the business world is being forced to make, are generating an opportunity for widespread acceptance of mobile payments. The present research analyzes the intention to use the Apple Pay mobile payment system, as well as contextualizing and evaluating the different antecedents of its use. To carry out the research, 539 users were invited to respond to an online questionnaire, and an analysis of structural equation modeling was used. The results indicate that perceived value is the variable that most influences the intention to use the proposed payment system, followed by perception of utility and risk. This work has important implications for companies in the sector.

Keywords: mobile payment; Near Field Communication; Apple Pay; intention to use

1. Introduction

In the 10 years since the World Summit on the Information Society, access to and use of information and communication technologies (ICT) has increased considerably, particularly mobile telephone and internet services. The latest report of the International Telecommunication Union [1] highlights that 97% of the world's population now lives within reach of a mobile cellular signal, and 93% (or higher) within reach of a 3G network, while the number of mobile phone subscribers has increased from 2.2 billion in 2005 to about 8.16 billion in 2018 [1].

In light of this data, and seeking to thrive in an era of disruption, most technology companies are focusing their efforts on increasing the number of services available through these devices, while marketers are looking for tools that will help them advance the process of digital transformation and allow them to modernize their marketing tactics to focus on customer experience strategies.

Following this trend, several BigTech and FinTech companies are launching payment services, such as mobile wallets and payment applications. The many features of these tools range from optimized user interfaces to customized content, generated by the ability of these applications to collect rich customer data, which enables companies to personalize and optimize the customer experience, and allows retailers to strengthen their customer relationships and create new customer experiences from data on purchasing behavior [2]. Considering all the above, mobile payment services, also known as m-payments, are perfectly positioned to drive the digital transformation of all businesses.

According to Statista [3], the transaction value of the mobile Point Of Sale (POS) payments segment reached USD 1,363,783 million in 2020, and is expected to show an annual growth rate (CAGR 2020–2024) of 41.0%, reaching USD 5,384,138 million by 2024. The same study also highlighted that the number of users of mobile POS payments is expected to rise to 1754.6 million by 2024 [3].

The use of mobile payment systems is closely related to the technological developments of recent years. There are currently five main technologies implemented in mobile payments: Short Message Service (SMS), Wireless Application Protocol (WAP)/Internet, Near Field Communication (NFC), Unstructured Supplementary Service Data (USSD), and voice services. NFC technology—the preferred option of the main companies related to the mobile phone sector (hardware and software companies, suppliers or carriers, and financial entities)—has experienced the greatest increase, and hence was the technology chosen in this research. The Apple Pay mobile payment system was also chosen for this study because it is the most-used mobile payment application in Spain (26%), after the different applications offered by banks (42%), according to the latest report by Ditendria [4] (although only 24% of purchases made in shops or restaurants were made using this application). Other entities—such as Banco Santander, Europe’s leading bank—have also implemented mobile payment systems for their customers.

Based on the above, it can be said that, in the context of the current digital transformation of business, mobile payment and wallet apps like Apple Pay are capable of generating positive impacts in all of the five main business strategy domains that were proposed by Rogers [5]: customers, competition, data, innovation and value. This study aims to understand the factors that affect the adoption of these tools by users, and how mobile payments can be key tools for helping companies on their journey to digital transformation.

In this paper, therefore, the level of intent to use the Apple Pay mobile payment system is analyzed, and we contextualize and assess the different antecedents to its use. To achieve this objective, a series of research hypotheses are proposed that relate the adoption of these systems to their main determinants. Having first specified the different methodological aspects of the research conducted, an analysis of the data compares the hypotheses put forward. Finally, a series of conclusions and recommendations for management, based on the results obtained, is presented.

2. Literature Review

2.1. *Mobile Payment as a Tool for Digital Transformation*

There is no doubt that technologies have changed the dynamics of business, partly because digital technologies have placed immeasurable power in the hands of consumers. All the barriers to purchasing that once existed have been definitively eroded, and consumers now have an infinite number of options that no longer depend on geography, time, price, and model or information limitations. As a result, there has been a fairly significant change in consumer behavior, with consumers becoming extremely demanding and now having the power to significantly affect an organization’s reputation, though, for example, a simple opinion posted on a blog, social media networks, or even the company’s website.

Considering the role the consumer now plays in companies’ success, Altimeter [6] defined the digital transformation as: “The realignment of, or new investment in, technology and business models to more effectively engage digital customers at every touchpoint in the customer experience lifecycle”.

However, the term digital transformation is also commonly associated with significant investment in, and implementation of, new technologies, while the elements that companies need to really consider themselves in the process of digital transformation go beyond this, and can vary considerably according to the type of business [7]. Technology has a role in the digital transformation process, and that role is to reshape the business to compete in an increasingly digital economy.

If we focus on the importance of the customer experience lifecycle and the need for companies to enter the digital transformation process, using technology for the purpose of remodeling business strategies, a mobile payment application—a highly effective communication channel between company and consumer—can be a great ally.

A good example of the power of this tool for businesses undergoing digital transformation processes is the speed with which payment transactions can be made, thus reducing queues and waiting times.

Previous studies [8] have already shown the importance of reducing waiting times for companies, as this is a factor with the potential to greatly compromise the consumer's shopping experience.

Making a broader connection between the functions provided by mobile payment and the five domains of digital transformation proposed by Rogers [5], certain relationships, listed below, stand out.

Customers: Among the benefits of the use of mobile payment are speed of payment, convenience of storage of large numbers of loyalty cards in the mobile, and even the ability to customize promotions to the purchasing behavior of the user. This provides the consumer with a more satisfactory and dynamic shopping experience, and the availability of mobile payments can also become a factor in the decision of whether to buy from one brand/store or another.

Competition: Mobile payment systems, as well as wallet apps, such as Apple Pay, end up becoming a channel for competition and cooperation between companies and other players in the sector. Increasingly, digital technologies are being used to create and capture value by facilitating interactions between other companies or customers. Therefore, it is possible that the use of mobile payment in business may provide new ways to compete and cooperate with other same-sector companies with common interests, interdependent business models, or mutual challenges outside the industry.

Data: Without doubt, mobile payment systems can provide businesses with key information for numerous uses. These systems can provide purchase information ranging from the amount spent during a certain period in a business, to the most- or least-used payment method (Visa, MasterCard, cash, etc.). They also allow the sharing of information pertaining to loyalty cards, which can be used even without the payment function, making it possible to quantify purchases made either with or without a mobile phone (the latter usually in cash). In addition, they provide data on whether a particular consumer spends more on clothes, restaurants, transport or supermarkets, and even which places they frequent most often.

Innovation: The information and functions provided by these payment tools allow retailers to develop, test and bring new ideas to the market in a definitive way. Mobile payment is a system that enables the testing of new ways to improve the consumer experience through the facilitators of the purchase process. With this approach, mobile payment usage strategies are developed iteratively, through a process that saves time, reduces the cost of failed experiments, and improves organizational learning.

Value: Mobile payment systems allow companies to use elements provided in other domains to promote the generation of customer value, through more effective marketing campaigns and more personalized promotions, and also to adapt processes in the company in line with an enhanced understanding of their customers' needs. It is important to emphasize that, in a changing business environment, it is essential to take a path of constant evolution, with continual evaluation of the technologies that are able to extend and improve the value proposition offered to consumers, as is the case with mobile payments.

2.2. User- and Mobile Phone-Related Factors: Mobile User Skillfulness, Personal Innovation and Effort

Skillfulness, or the ability to use a given technology, is defined as a combination of the experience, training and knowledge the individual has regarding that technology. Greater confidence in the ability to use a technology will lead to a greater intrinsic motivation to use it [9]. For its part, perceived usefulness shows how people believe that a given technology can improve their productivity or performance in any work task [10]. In addition, positive evaluation of the user's mobile expertise will reduce anxiety regarding the adoption of mobile services, and it will increase their enjoyment of mobile purchases/payments and their perception of the usefulness of mobile information, thereby increasing their intention to use it [11,12]. Based on these arguments, the following research hypothesis is proposed:

Hypothesis 1. *Mobile user skillfulness positively influences the perceived usefulness of the Apple Pay system.*

Personal innovation, according to Agarward and Prasad [13], can be defined as the willingness of an individual to try out any new ICT conceptualized as a feature, which is not influenced by environmental or external variables. In line with Ramos-de-Luna et al. [14], we consider NFC payment to be an innovative technology for the mobile market, and likely to be a trend in general commerce worldwide within a few years. The concept of perceived innovation is related to the product/service itself, as well as user perception and the improving of consumer emotion, interest and, consequently, intention to use [15]. The level of innovation may therefore determine, to some extent, consumer intention to use the proposed payment system, raising the following research hypothesis:

Hypothesis 2. *The individual's personal innovation positively influences the perceived usefulness of the Apple Pay system.*

Perceived usefulness is one of the most important original constructions of the technology acceptance model (TAM), and has been widely studied as a central variable in the adoption of new technology. In the context of our research, we understand that the usefulness of the payment system will influence intention to use. A body of research, which includes studies focused on mobile banking [16,17] and mobile payments [18–23], supports this approach. For all these reasons, the following hypothesis is proposed:

Hypothesis 3. *The perceived usefulness of the Apple Pay system positively influences intention to use.*

Effort expectation is described as the degree of ease associated with the use of the technology by consumers [24]. Some authors identify the expectation of effort with Davis's ease-of-use variable [10,25], and many of the relationships proposed in various research studies have obtained similar results [26,27]. Many mobile terminals currently include different services that improve user ability, and consequently continued use intention, by reducing the effort required to manage them [28,29]. We therefore propose the following hypothesis:

Hypothesis 4. *The effort required by the user of Apple Pay has a negative influence on intention to use.*

2.3. Factors Related to Benefits Received: Convenience and Perceived Value

In today's marketing landscape, consumers value companies that offer value by incorporating amenities during the search for, access to, and purchase and use of services [30], and users value technology best when it makes their lives easier [31,32]. NFC mobile payment has a variety of features and user benefits that reinforce this approach [23]. Convenience is a combination of time and place utility, which can impact a user's decision to use a particular system [33] and consequently the perceived value of the system. Convenience of use will thus have a positive effect on perceived value [34,35], giving rise to the following hypothesis:

Hypothesis 5. *Convenience of use of the Apple Pay system positively influences the perceived value held by the user.*

Perceived value is defined as the result of the consumer's comparison of the perceived benefits versus the perceived sacrifices [36]. According to Molina [37], the value of commercial transactions as perceived by the consumer is subjective in nature, since it involves evaluative judgment; many studies have pointed out the various components employed by consumers in their evaluations. Similarly, a relationship has been identified between the user's perceived value and their intention to use a tool. In our study, perceived value will enhance intention to use the mobile payment system. Previous

studies have corroborated this approach [38–40], and therefore the following research hypothesis is proposed:

Hypothesis 6. *The perceived value of the Apple Pay system held by the user positively influences their intention to use.*

2.4. Mobile Payment Inhibitors: Perceived Risk

The influence of perceived risk on consumer behavior has attracted the attention of researchers since Bauer's seminal work [41], in which he distinguishes two components: (1) the consumer's uncertainty or lack of knowledge regarding what may happen when they make the purchase, and (2) the possible negative consequences of this purchase. Bauer goes on to affirm that all consumer behavior involves risk, since the consequences cannot be reliably anticipated [42]. Gefen et al. [43] define it as the consequences of a decision, which incorporates the variety of the possible results. Gerrard and Cunningham [44] define perceived risk as the possibility that use of the innovation is not safe. Perceived risk has also been given great importance in different modelings of the adoption of information systems, reflecting users' perceptions of uncertainty and the adverse consequences of participation in the activity, which thereby reduce their intention to use and continue to use [29,45]. The following hypothesis is proposed:

Hypothesis 7. *Perceived risk in the Apple Pay system negatively influences intention to use.*

Figure 1 shows the theoretical model proposed for the present study, which includes the previously hypothesized relationships.

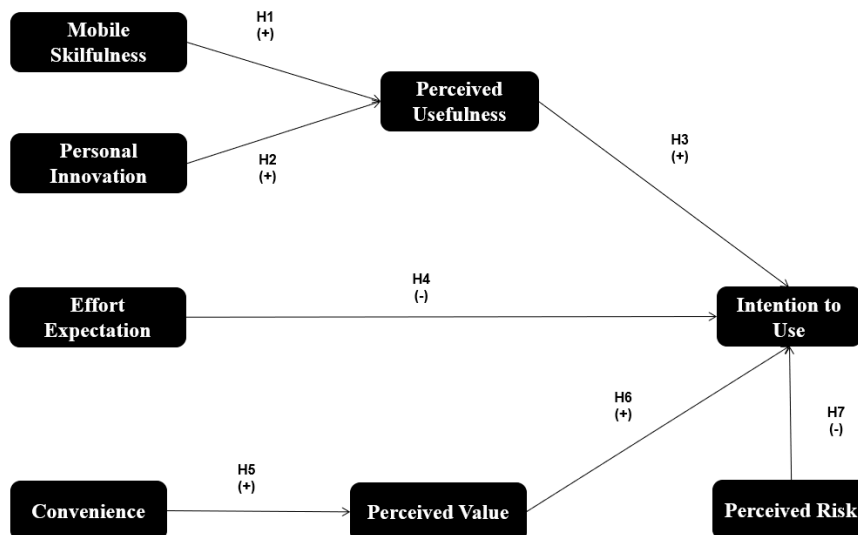


Figure 1. Proposed model.

3. Research Methods and Measures Validation

To meet the study objectives, an online survey was carried out using a “snowball” non-probabilistic procedure, which was carried out by sending a message to individuals in this study's researchers' social networks, on platforms like LinkedIn and Facebook, who were residents in Spain and who forwarded the survey to their peers (residents in Spain too). The message sent included an invitation to participate in mobile payment research and contained the link to access the questionnaire, which guaranteed that the data would be treated and published anonymously, and the confidentiality of participants' information was also guaranteed.

The questionnaire was structured in four sections. In the first section, the respondent watched a video explaining the tool to be analyzed. The second section included a number of evaluation questions designed to confirm the interest and coherence of the subject, while the third section grouped the items to solve the proposed research objectives. The fourth and final section contained the user's socio-demographic information and other classification variables.

The measuring instruments were adapted from previous studies: mobile user skillfulness from the research of Lu and Yu-Jen Su [46], personal innovation from Ramos-de-Luna et al. [15], perceived usefulness from Davis et al. [10], effort expectation from Venkatesh et al. [24] and Hew et al. [47], convenience of the mobile payment system from Pal et al. [33], perceived value from Liébana-Cabanillas and Alonso-Dos-Santos [39], perceived risk from Liébana-Cabanillas et al. [48] and, finally, intention to use from Venkatesh and Bala [49]. Details of the scales are given in Appendix A.

A series of measures were taken to prevent the appearance of common method bias [50]: the questions were reviewed by experts in the marketing and adoption of digital payments, to ensure that the questions were clear, concise, precise and well written; an explanatory message delivered before the survey guaranteed the anonymity of the respondents; and the questionnaire included elements framed both positively and negatively to avoid extreme response and acquiescence response bias.

The collection of data took approximately three months, and within this period 539 valid questionnaires were collected. The eliminated questionnaires (less than 10% of the total collected sample) were selected mainly because of the lack of answers for the most important variables [51]. The sample details are shown in Table 1.

Table 1. Sample details.

	Number	Percentage
Gender		
Man	277	51.50%
Woman	262	48.50%
Age:		
18 to 24	214	39.70%
25 to 34	154	28.57%
35 to 44	91	16.88%
45 to 54	48	8.91%
55 to 64	21	3.90%
Over 65	11	2.04%
Level of education		
No education	8	1.62%
Primary education	56	10.39%
Secondary education	153	28.57%
Higher education	288	53.57%
Other	34	5.84%
Income level		
No income	99	18.83%
<EUR 900	153	28.57%
EUR 901–1200	104	19.48%
EUR 1201–1500	77	14.29%
>EUR 1501	106	18.83%

3.1. Evaluation of the Measurement Scales Used

The suitability, reliability and validity of the measurement scales were tested with a series of exploratory and confirmatory analyses, using SPSS 18.0 and AMOS 18.0, respectively.

3.2. Exploratory Analyses

Firstly, Cronbach's alpha indicator was used to measure the reliability of the scales, taking 0.7 as the reference value [52]. All the variables obtain good or very good values ($\alpha > 0.8$).

Subsequently, an exploratory factorial analysis (EFA) was carried out using the principal component extraction model to test the degree of unidimensionality of the scales. The analysis

was verified as adequate for the variables under study, for the following reasons: (1) the proportion of the variance that the variables have in common, based on the Kaiser-Meyer-Olkin coefficient (KMO), always exceeds the value of 0.5, indicating that the sample adaptation is correct; (2) Bartlett's sphericity test is significant (p -value ≤ 0.001), thus rejecting the null hypothesis regarding the absence of differences between the correlation matrix and the identity matrix; (3) the correlation coefficients of the anti-image correlation matrix outside the main diagonal present low values; and (4) the existence of high communalities (>0.5) in the variables under analysis was verified, which suggests that all the variables are well represented in the common factor space, and that the factor loads in the indicators exceed the recommended minimum ($R^2 > 0.5$).

Therefore, it can be concluded that the measurement scales have a one-dimensional structure.

3.3. Confirmatory Analysis

A confirmatory factor analysis (CFA) was performed to test the convergent and divergent validity of the scales. Convergent validity was evaluated through the factor loads of the indicators. It was verified that the coefficients do not differ significantly from zero, and also that the loads between the latent and observed variables are high in all cases (>0.7), once one is eliminated from the ease-of-use construct. Therefore, it can be stated that the latent variables adequately explain the observed variables [53].

With respect to discriminant validity, the variances were found to differ significantly from zero, and the correlation between each pair of scales was no greater than 0.8. We can say, therefore, that there are five individual constructs, because the relationships between the constructs are weak.

Once again, the reliability of the scales can be assessed via a few indicators extracted from the confirmatory analysis. Precisely speaking, the construct reliability (FCC) and analysis of variance extracted (AVE) exceed the reference threshold (0.7 and 0.5, respectively), as well as other global adjustment indicators for the measurement model [53] (see Table 2).

Table 2. Analysis of the composite reliability and the variance extracted.

Construct	Items	Standard Coefficient	Composite Reliability	Variance Extracted
Mobile skillfulness (MS)	MS1	0.815	0.89	0.74
	MS2	0.906		
	MS3	0.856		
Personal innovation (PI)	PI1	0.88	0.93	0.76
	PI2	0.898		
	PI3	0.832		
	PI4	0.871		
Effort expectation (EE)	EE1	0.891	0.94	0.81
	EE2	0.911		
	EE3	0.897		
	EE4	0.891		
Convenience (CO)	CO1	0.825	0.94	0.77
	CO2	0.892		
	CO3	0.893		
	CO4	0.915		
	CO5	0.866		
Perceived value (PV)	PV1	0.819	0.89	0.72
	PV2	0.846		
	PV3	0.884		
Perceived risk (PR)	PR1	0.876	0.91	0.71
	PR2	0.893		
	PR3	0.831		
	PR4	0.818		
Perceived usefulness (PU)	PU1	0.865	0.89	0.68
	PU2	0.875		
	PU3	0.803		
	PU4	0.849		
Intention to use (IU)	IU1	0.904	0.92	0.80
	IU2	0.892		
	IU3	0.891		

Indicators of composite reliability and variance extracted for all model dimensions were found to be above the recommended limits (>0.7 and >0.5, respectively [53]).

4. Results

Once the reliability and validity of the measurement scales had been analyzed, the research hypotheses supported by the literature review were assessed. To this end, a model of structural equations was developed, using the maximum plausibility method with the resampling or bootstrapping technique (with 500 replications), since the assumption of multivariate normality was not met (see Table 3).

Table 3. Main adjustment indicators of the proposed model.

Coefficient	RMSEA	GFI	AGFI	CFI	NFI	IFI
Model value	0.05	0.89	0.87	0.96	0.94	0.96
Recommended value *	≤0.08	≥0.90	≥0.90	≥0.90	≥0.90	≥0.90

RMSEA—root-mean-square error of approximation; GFI—goodness-of-fit index; CFI—comparative goodness-of-fit; NFI—normed fit index; IFI—incremental fit index. * Hair et al. [53].

The absolute, incremental and parsimony fit measures indicated that the model was a reasonably good fit. To evaluate the structural model, the statistical significance of the structural loads was analyzed, as well as the R² coefficients.

The final results of the behavioral model, which measured intention to use the new mobile payment system as well as the standardized coefficients of each relationship introduced in the analysis, are shown graphically in Figure 2.

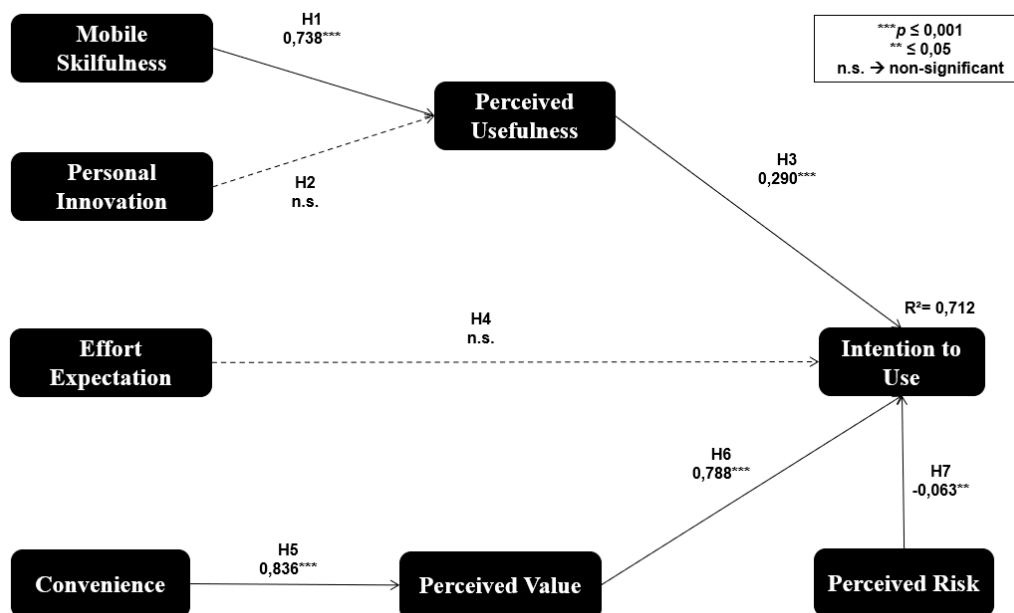


Figure 2. Proposed model results.

The results of the analyses carried out confirm five of the seven proposed hypotheses by verifying their meaning and significance, but do not allow us to accept the proposed relationships between personal innovation and perceived usefulness (Hypothesis 2), and effort expectation and intention to use (Hypothesis 4).

In relation to the significant paths, the relationship between convenience and perceived value was the one that presented the greatest strength of the whole model ($\beta = 0.836$, p -value < 0.001). Following

this, it was found that perceived value was the most significant predictor of the intention to use, presenting a path coefficient value of 0.788 (p -value < 0.001).

Furthermore, the relationship between mobile skillfulness and perceived usefulness also represented one of the strongest in the model ($\beta = 0.738$, p -value < 0.001). Although the relationship between perceived usefulness and intention to use was weaker than the others in the model, it was also a significant predictor of the intention to use the payment system studied ($\beta = 0.290$, p -value < 0.001). Finally, the relationship between perceived risk and intention to use was shown to be significant, and to have a negative effect on intention to use ($\beta = -0.063$, p -value < 0.05).

The predictive power offered by the model regarding the intention to use the mobile payment system studied is 71.2%, which represents a fairly significant value, considering other models that study the adoption of mobile payments [14,15,21,27,54].

5. Discussion

Cash in its various physical forms has been used for hundreds of years, but nowadays physical money is actively discouraged in many types of transactions where it used to be common, such as paying for a bus ticket, shopping in a supermarket, or the purchase of capital goods. We are currently transitioning to a cashless society, and the facts that 66% of the world's population has access to at least one active mobile phone terminal, and that more than 4.57 billion people have access to the Internet [55], lead us to believe that the market is gearing towards the implementation of the mobile phone as a purchasing and payment tool, and that in a few years its use will be widespread throughout the world.

In addition to this general trend, the coronavirus crisis has meant that mobile payments, by keeping economies functioning and helping people reduce contact with the virus, have received a little more attention [56]. Contactless mobile payments at the point of sale, using facial recognition, QR codes or NFC codes, also help to prevent the spread of the virus through cash exchanges and physical contact, making this a safe payment method from this point of view for consumers and businesses alike, and indicating its great potential as a means of payment in the near future.

China is the current world leader in the adoption of proximity mobile payments, with 81.1% usage penetration [57], though this share is expected to decrease as the number of users in other parts of the world increases. According to Statista [3], more than 903 million people used mobile payment platforms to carry out financial transactions in 2019, with some 441 million users opting for the use of Apple Pay [58], all of which illustrates the growth potential of this type of payment today.

This study therefore proposes a behavioral model that explains the acceptance of mobile payments, whereby the user can perform a transaction in an agile and secure way. To develop such a model, various theories of the adoption of new technologies have been used as a basis, such as TAM [10,59], the unified theory of acceptance and use of technology (UTAUT) [24,60], and their variants, with the addition of other concepts considered important for the study of this type of technology, such as mobile user skillfulness, personal innovation, convenience and perceived risk.

Among the findings, convenience was observed to be one of the most important variables of the model, presenting a significant positive influence on the perceived value of the payment method. It is possible that this relationship is generated by the convenience of using a device that we carry with us at all times to make payments and purchases quickly and easily.

Unlike other technological innovations, where the need for their existence is one of the major motivators of adoption, in the case of mobile payments, the convenience provided by this method, makes that feature one of the strongest motivators for adoption. Convenience has always been the driving factor in the payments industry, and this study shows that the more fluid the payment act, the more value it has for the user.

Convenience of use therefore increases the user-perceived value, making the user more likely to adopt the payment method studied, and this is borne out in the model, in which the relationship

between perceived value and intention to use presented as the second strongest relationship in the model, becoming a reference element for intention to use such a tool.

The fact that perceived value affects the intention to use the mobile payment method studied suggests a need for companies to use service-dominant logic in their marketing of the service, so as to create immersive user experiences; in other words, generate marketing strategies focused on the user's holistic and internal mechanisms, so as to assign meaning and generate a response to the value proposals of mobile payment, or even the brand that promotes them [61].

It has also been shown that mobile user expertise positively influences the perceived usefulness of the tool studied, this being the third strongest relationship. This suggests that greater familiarity with mobile phones and their complexities will make the user more likely to perceive the mobile device as a useful payment tool.

In accordance with previous studies [10,18,62], it was observed that perceived usefulness positively influences intention to use. We can therefore state that the perceived usefulness of the payment method studied by consumers is essential for its dissemination, since this factor has been shown to be a determinant of intention to use the tool.

In addition, a significant relationship was found between perceived risk and intention to use. Even when the perceived risk is small, the effect is still negative as stated, allowing us to conclude that the greater the perceived risk, the lesser the likelihood of the user adopting the payment tool. This result is in line with studies of other mobile technologies related to the purchasing process [63–65].

On the other hand, it was observed that personal innovation does not affect the perceived usefulness of this method of payment, nor does the expectation of effort have any effect on intention to use it in the future. These results allow us to affirm that the perceived usefulness of the tool studied is not affected by different levels of personal innovation, suggesting that the final utility of the product does not correspond to the degree of innovation perceived by the subject. In addition, the absence of significance in the relationship between effort expectation and intention to use may be due to the fact that the tool studied offers an intuitive user experience, as well as a fluid user journey, and as a consequence its use does not imply a significant effort for the user, or this at least become less so over time.

In short, and according to the results found, we especially recommend that companies interested in promoting the use of mobile payment concentrate their efforts on, and allocate resources to, adding value to the payment tool and reducing the perceived risk of using it, encouraging the customer to see the advantages of using this payment method. At the same time, we recommend that companies direct their marketing actions towards users who already have mobile user skills, as this user group is more likely to appreciate the utility and benefits of mobile payments.

Limitations and Future Lines of Research

In common with most research papers, this study has a number of limitations that may lead to future lines of research.

Firstly, with regard to the context in which the research was conducted, the payment system analyzed, despite being the most downloaded, has a penetration of only 4% of the Spanish market, making it difficult to generalize from the results.

Secondly, the sample, though a good size, was obtained under a non-probabilistic sampling design (snowball), and this may have biased the results. It can also be observed that the distribution of the sample has a younger profile than is desirable.

Regarding the data collection method, a cross-sectional study was carried out, which makes it impossible to analyze the evolution of user behavior over time. A longitudinal approach would make it possible to test the robustness of established relationships and constructs.

Finally, the conclusions arrived at in this paper, as well as the limitations, suggest a series of future lines of research in relation to intention to use the new mobile payment systems and, more specifically, Apple Pay.

Future studies could complete the present research by incorporating the measurement of actual use of the proposed tool, and comparing the results with other mobile payment systems. Once measurement of actual use has been assimilated, it will then be possible to contrast the relationship between intention and use, and draw the most important conclusions. In addition, to obtain greater consistency in the results, the study should be repeated in successive years, in order to verify the effect of experience and review how this affects the other variables and relationships.

Another future line of research should explore the influence of external elements (safety seals, supplier brands, etc.) on risk perception and intention to use.

To provide the results of the present research with greater external validity, a comparative study of different payment systems is proposed, establishing categorization and a usage profile for each, and including other technologies currently being proposed as substitutes for card payment, also coming under the definition of mobile technology (mainly NFC).

Finally, from the perspective of studying consumer behavior, it would be interesting to consider introducing moderating variables and observing the relationships between them, as well as determining which are the most relevant to the adoption of this type of payment system.

Author Contributions: Conceptualization, F.L.-C. and I.R.-d.-L.; methodology, software, and validation, F.L.-C., F.M.-L. and I.G.-M.; formal analysis, investigation, resources, and data curation, F.L.-C., I.R.-d.-L. and F.M.-L.; writing—original draft preparation, F.L.-C. and I.R.-d.-L.; writing—review and editing, I.G.-M. and F.M.-L.; visualization, supervision, project administration, F.L.-C. and I.R.-d.-L. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A Scales Used

Appendix A.1 Mobile User Skillfulness (Lu et al., 2009)

- I feel confident using the payment system displayed to complete an online transaction efficiently (MS1)
- I would be able to use the payment system displayed to complete an online transaction in a short period of time (MS2)
- I would be able to use the payment system displayed to complete an online transaction in a short period of time if I had used a similar system before (MS3)

Appendix A.2 Personal Innovation (Ramos-de-Luna et al., 2016)

- I like to experiment with new technologies (PI1)
- Among my friends and family, I am usually the first to try out new information technologies (PI2)
- In general, I would not hesitate to test new technologies (PI3)
- I would like to look for new ways to experiment with new technologies (PI4)

Appendix A.3 Effort Expectation (Venkatesh et al., 2012; Hew et al., 2015)

- Learning to use mobile applications is easy for me (EE1)
- In my interactions with mobile applications, I find them clear and understandable (EE2)
- I find mobile applications easy to use (EE3)
- It is easy for me to become proficient in using mobile applications (EE4)

Appendix A.4 Convenience (Pal et al., 2015)

- The payment system displayed is convenient because I usually carry the mobile phone with me (CO1)
- The payment system displayed is convenient because I can use it at any time (CO2)
- The payment system displayed is convenient because I can use it in any situation (CO3)
- The payment system displayed is convenient because it is not complex (CO4)
- The payment system displayed is convenient because it can be used regardless of location (CON5)

Appendix A.5 Perceived Value (Liébana-Cabanillas and Alonso-Dos-Santos, 2017)

- The payment system displayed is valuable and worth the time spent learning how to use it (PV1)
- The payment system displayed is useful to me and worth the effort made learning how to use it (PV2)
- The payment system displayed is useful for me thanks to the amount of experience I have (PV3)

Appendix A.6 Perceived Risk (Liébana-Cabanillas et al., 2014)

- Other people may access information about my online transactions if I use this mobile payment system (PR1)
- There is a high potential for monetary loss if I make purchases with this mobile payment system (PR2)
- There is a significant risk when making purchases using this mobile payment system (PR3)
- I consider making purchases with this mobile payment tool a risk (PR4)

Appendix A.7 Perceived Usefulness (Davis et al., 1989)

- Using the payment system displayed can help me make the purchases I normally make over the Internet (PU1)
- Using the payment system displayed can increase my efficiency when making purchases (PU2)
- Using the payment system displayed for my purchases can increase my productivity (PU3)
- In general, the payment system displayed can be useful to me when making purchases (PU4)

Appendix A.8 Intention to Use (Venkatesh and Bala, 2008)

- Assuming I have access to the payment system displayed, I intend to use it to make purchases (IU1)
- If I have access to the payment system displayed during the next few months, I believe I will use this system rather than another, alternative system (IU2)
- Assuming I had access to the payment system displayed, I would use it in the near future (IU3)

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