Tesis Doctoral

departamento de comercialización
e investigación de mercados

Pagos móviles en el punto de venta: Temas clave, perspectivas y directrices para la adopción entre futuros usuarios

Mobile Payments at the Point of Sale: Key Issues, Perspectives and Guidelines for Future User Adoption

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Tesis doctoral dirigida por
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UNIVERSIDAD
DE GRANADA

TESIS DOCTORAL

PAGOS MÓVILES EN EL PUNTO DE VENTA:

Temas clave, perspectivas y directrices para la adopción entre futuros usuarios

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Granada, 09 de junio de 2017

Director de tesis

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A mis padres que lo dieron todo por mi y que me acompañan siempre.

A Rodrigo, que siempre ha creído en mi y me ha apoyado en todos los momentos altruistamente.

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Pagos Móviles en el Punto de Venta:
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RESUMEN

Propuesta/objetivos: Los pagos móviles tiene un elevado potencial para ser adoptados en poco tiempo, a la vez que los consumidores se interesan cada día más por los servicios móviles. En esta tesis doctoral se desarrollan cuatro estudios para comprender mejor los factores que influencian la decisión de adopción de los pagos móviles y sus variaciones entre diferentes entornos y tecnologías.

Diseño/Metodología/Enfoque: La literatura científica permitió generar cuatro modelos de adopción sobre la base, tanto de las teorías clásicas de adopción de nuevas tecnologías (como la TAM, TPB, TRA, entre otras), como de las teorías más actuales y específicas relacionadas a la adopción de servicios móviles. Los modelos incluyen diferentes variables relacionadas tanto con las características propias del pago, como con las características del usuario. Se analizó la intención de uso de los pagos móviles por SMS, códigos QR y NFC, además de estudiar el efecto del interés del consumidor en usar servicios móviles adicionales al pago móvil como determinante del uso de este último. La investigación se llevó a cabo en España, Brasil y Alemania por medio de encuestas por Internet autoadministradas que se pueden dividir en cuatro estudios. Las muestras han sido de: 168 individuos en el estudio 1; 871 individuos en el estudio 2; 423 individuos en el estudio3; y 2.210 individuos en el estudio 4.

Hallazgos: Entre los diversos hallazgos presentados en esta tesis doctoral, podemos destacar que los modelos utilizados tienen un alto poder predictivo de la intención de uso del pago móvil (entre 56 y 71%). Todas las variables incluidas han demostrado ser importantes en el proceso de adopción del pago móvil, pudiendo destacar la actitud hacia el uso, o la utilidad percibida. La innovación personal, por su parte, se ha presentado relevante de diversas maneras, tanto como antecedente de la intención como moderador del comportamiento. Finalmente, el interés del consumidor por los servicios móviles también ha probado ser un antecedente relevante del uso de pagos móviles.

Originalidad/valor: Desde el punto de vista académico, esta tesis ofrece contribuciones relevantes, ya que los estudios incluidos están entre los primeros en probar empíricamente los determinantes de la aceptación por el consumidor de los pagos por códigos QR, NFC y SMS, y del papel de los servicios de marketing móvil en la adopción del pago móvil. Además, este estudio se ha planteado desde la perspectiva del consumidor, y ofrece una serie de recomendaciones y estrategias dirigidas a potenciar la adopción del pago móvil y de los servicios integrados de pago móvil.

Palabras clave: NFC, códigos QR, SMS, adopción del pago móvil, servicios móviles, pagos sin contacto.

Mobile Payments at the Point of Sale:

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SUMMARY

Proposal/Objectives: There is a great potential for adoption of mobile payment in the near future as consumers are increasingly interested in mobile services. This doctoral thesis groups four studies that shed light on the factors that influence the decision to adopt mobile payments and their variations in the framework of different environments and technologies.

Design/Methodology/Approach: Scientific literature yields four models of mobile payment and services adoption based on the classic theories of adoption of new technologies (among others the TAM, TPB and TRA), as well as more recent and specific theories related to mobile services adoption. The models include different variables related to the characteristics both of the payments and users. Moreover, this thesis analyzes the intention to use mobile payments by SMS, QR codes and NFC as well as the effect of consumer interest in the offer of additional mobile services to mobile payments as a determinant to adoption. The research was carried out in Spain, Brazil and Germany by means self-administered web surveys that can be broken down into four studies. The samples were of: 168 individuals in the study 1; 871 individuals in study 2; 423 individuals in the study 3; and 2,210 individuals in the study 4.

Findings: Among the findings to highlight from this doctoral thesis are the models that reveal a high predictive power of the intention to use mobile payments (between 56 and 71%). While all the variables are seen to play an important role in the process of mobile payment adoption, attitude toward use and perceived usefulness stand out. Personal innovation, for its part, is relevant in various ways as an antecedent of intention and as a moderator of behavioral intention. Finally, consumer interest in mobile services is also proven to be a relevant precedent of mobile payment adoption.

Originality/Value: The relevance of this thesis from the academic point of view is the contributions it offers as its studies are among the first to empirically test the determinants of consumer acceptance of payments by QR codes, NFC and SMS, and the role of mobile marketing services in the adoption of mobile payment. Furthermore, this study assumes the perspective of the consumer and offers a series of recommendations and strategies aimed at enhancing the adoption of mobile payment and integrated mobile payment services.

Keywords: NFC, QR codes, SMS, mobile payment adoption, mobile services, contactless payments.

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CAPÍTULO 1

INTRODUCCIÓN

En este capítulo se presenta el panorama tecnológico actual en relación con los medios de pago, así como la importancia que tienen las tecnologías financieras, y especialmente los pagos móviles, en el contexto social y empresarial. Además, se expone el potencial que las tecnologías financieras tienen en el cambiante contexto financiero y comercial, así como su importancia en la vida del consumidor. A partir de ello se plantea el problema de investigación, así como los objetivos planteados para el desarrollo de las investigaciones que componen esta tesis, y las limitaciones de este compedio de cuatro trabajos. Para finalizar se expone la estructura y y organización de esta tesis doctoral.

La tendencia es global e irreversible. Los dispositivos móviles están cada día más presentes en nuestras vidas y su adopción va creciendo de una forma más rápida que la pronosticada inicialmente. El desarrollo de la oferta de estos dispositivos y su creciente uso han modificado nuestras rutinas. Esta tendencia ha sido determinada de manera muy especial por la aparición y posterior evolución de los smartphones, ya que tienen la capacidad de agregar aplicaciones en constante desarrollo que solucionan operaciones que antes nos exigían una mayor inversión de tiempo, y que permiten optimizar y potenciar la comunicación, ya sea como destinatario de noticias y novedades específicas, o como generador de contenido en los medios sociales.

Investigaciones recientes realizadas y publicadas por Ditrendia (2016) indican que la penetración de teléfonos móviles a nivel mundial alcanzó el 97% en 2015, lo que significa un aumento de 563 millones de teléfonos móviles durante el año, totalizando 7,9 mil millones de dispositivos al final de 2015. Aunque se espera que en los próximos años las ventas de smartphones se desaceleren, dada a la madurez de los mercados norteamericano, europeo y chino, las ventas en 2015 aumentaron un 13% en el mundo, respecto al año anterior.

Aún de acuerdo con Ditrendia (2016), entre las regiones del mundo donde hay una mayor penetración móvil están el Centro y Este de Europa con 139%, seguidos por Europa Occidental y Suroeste de Asia con 124%, y Oriente Medio con 123%. España es el país con mayor penetración de Smartphones en Europa, un 80% de los españoles tiene un smartphone, lo consultan una media de 150 veces al día, y se empieza a usar desde los 2 años de edad. Por contra, las regiones con penetración más baja son el Sur de Asia (77%), África con (82%) y Centro América con (88%) (Ditrendia, 2016). La figura 1 muestra el porcentaje de penetración móvil en el mundo.

Figura 1 - Penetración móvil en el mundo
Fuente: Ditrendia (2016)

Por otro lado, el número de usuarios de smartphones continuará creciendo. Los estudios estiman que, si en 2016 hay 4,61 mil millones de usuarios de móviles en el mundo, 2,08 mil millones son usuarios de smartphones, y la previsión es que en 2019 esta cifra superará los 5,07 mil millones, de los cuales 2,65 serán smartphones (Ditrendia, 2016).

En esta nueva era en la que los dispositivos móviles se convierten en el centro de actividades diarias, muchos servicios existentes que eran eficientes mientras no existían los ofrecidos por estos dispositivos tendrán su fin, en igual medida que ocurre con todos los cambios profundos que afectan a las costumbres sociales (TicWeb, 2016). De igual manera, otros servicios nacerán y se desarrollarán de una manera optimizada e innovadora.

Siguiendo esta tendencia, el mercado móvil en los últimos años ha llevado a los proveedores de pagos, bancos y empresas de tecnología a orientarse hacia el mercado móvil para futuras soluciones de pago. Las tecnologías financieras están actualmente en crecimiento exponencial. La industria FinTech, que reúne todas aquellas empresas de servicios financieros que utilizan las más nuevas tecnologías para ofrecer productos y servicios financieros innovadores, genera actualmente millones de euros que influyen directamente en la industria financiera y tecnológica. Esta importancia y potencial financiero es una razón que hace que la industria esté en disposición de alterar los modelos de negocios tradicionales en prácticamente todos los servicios y funciones financieras: banca, seguros, transferencias de dinero y pagos, el aprovisionamiento de mercado, gestión de inversiones, depósitos y préstamos, obtención de capital, etc.

La industria FinTech ha empezado a afectar significativamente los ecosistemas internacionales, ya que tiene un impacto importante en las tendencias, en el flujo de fondos entre actores del mercado, y en la atención que ejercen los organismos de control financiero. El Consejo de Estabilidad Financiera (*Financial Stability Board*-FSB), un organismo internacional que supervisa y hace recomendaciones sobre el sistema financiero mundial, así como otros expertos en el tema (Andresen, 2016, Mesropyan, 2016), creen que las FinTech se han convertido en un elemento vital para los ecosistemas internacionales, y que esta será una tendencia clara para el futuro. Algunas de las razones que provocan esta creciente importancia se resumen en la figura 2.

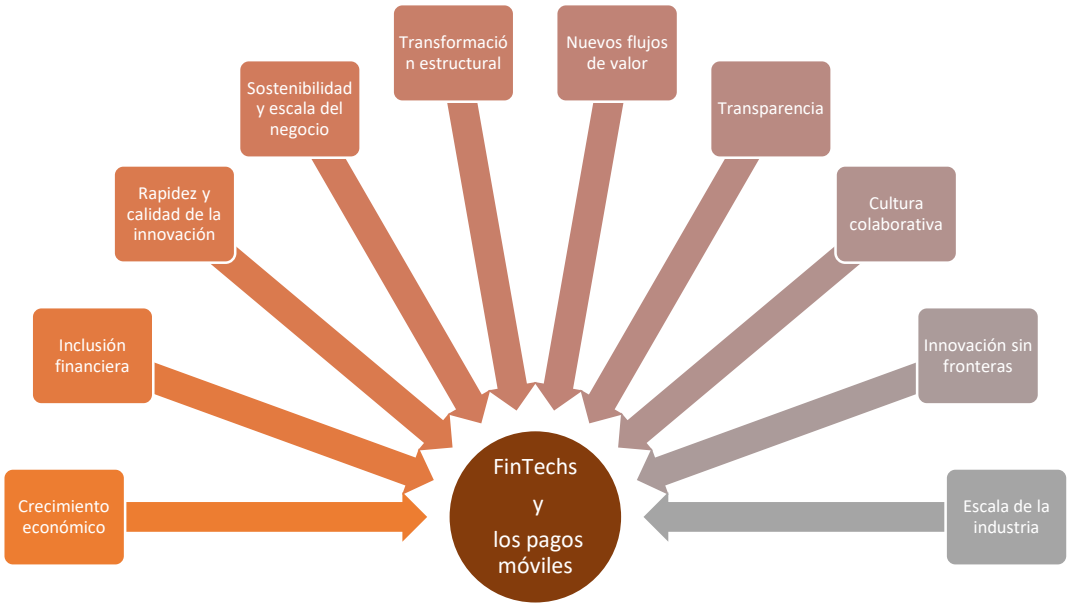

Figura 2 - Las 10 razones por las cuales las FinTechs son vitales para el mercado financiero

Fuente: Autor, basado en Andresen, 2016 y Mesropyan, 2016a)

De acuerdo con Mesropyan (2016a) el segmento de los pagos dentro del mercado FinTech es un elemento importante de crecimiento económico, añadiendo valor al PIB de un gran número de países desde 2011, generando nuevos puestos trabajo y reduciendo las tasas de desempleo.

Por otro lado, las FinTech facilitan cambios estructurales en el mercado, abriendo oportunidades para grupos de población previamente "invisibles" desde el punto de vista de la industria, o negocios financieros excluidos por su escaso volumen, integrando personas con pocos recursos en la tecnología, democratizando la industria de servicios financieros, y fortaleciendo la posición de pequeñas empresas FinTech en el ecosistema, al permitirles actuar de manera independiente (Andresen, 2016; Mesropyan, 2016a).

Además, las FinTech impulsan mejoras en los procesos financieros tradicionales y promueve la sustitución de los sistemas existentes con nuevas soluciones innovadoras, que pueden ofrecer beneficios a los consumidores y otros sectores de la economía, en cuanto a calidad y rapidez. Por otro lado, permiten a las empresas ampliar fácilmente las capacidades, operar con una mayor eficiencia y una escala manejable, de manera que se facilita la sostenibilidad de negocios en el medio y largo plazo.

Las FinTech permiten que las operaciones sean transparentes y se ejecuten en tiempo real, lo que genera nuevos flujos de valor, no sólo en los servicios financieros, sino en toda la economía, como es el caso de las nuevas monedas digitales. En la búsqueda de nuevas oportunidades de negocio, las instituciones financieras están en disposición de probar rápidamente nuevos proyectos para explorar nuevas fuentes de ingresos. La transparencia de los sistemas de pago se garantiza con la creciente implantación de auditorías sobre este tipo de negocios, conforme va aumentando su presencia en el mercado,

Además, el propio funcionamiento de las FinTech promueve la eliminación de barreras internacionales y entre industrias, facilitando una cultura de colaboración, lo que acaba también generando el intercambio de conocimientos en innovación.

Las FinTech han crecido en los últimos años y han pasado de ser un nicho de mercado de tamaño reducido o testimonial a convertirse en una industria global y con impacto relevante. A pesar de que en 2015 la industria presentó un crecimiento atípico, con un aumento de casi un 62% comparado con el año anterior, 2016 presentó una reducción en inversiones FinTech del 47%, resultando en un total de 24,7 mil millones de dólares (véase Gráfico 1).

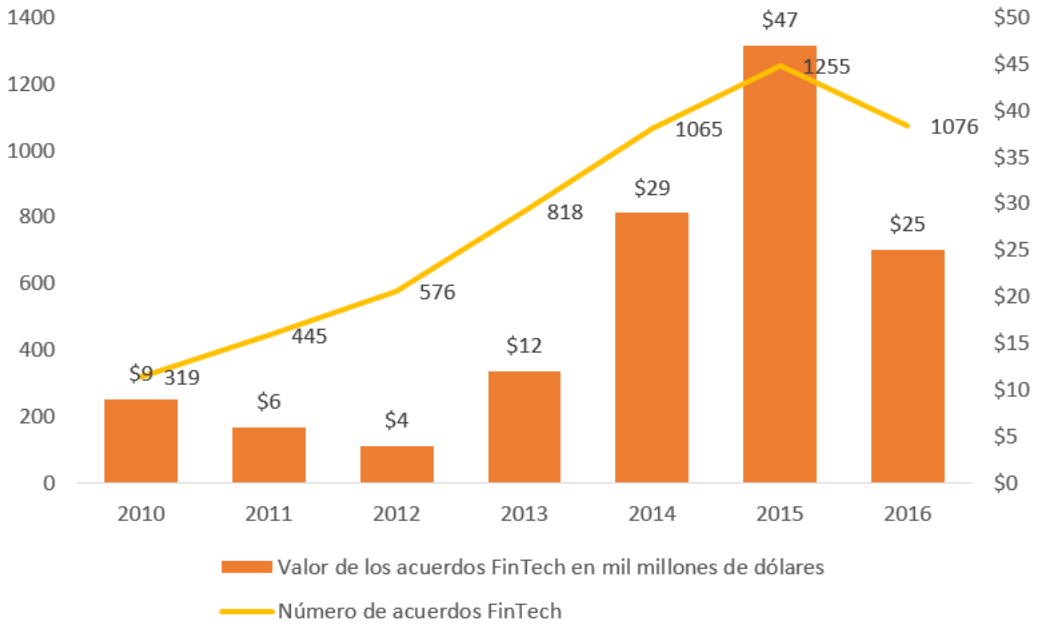

Gráfico 1 - Inversión total global en empresas FinTech

Fuente: KPMG (2017)

La disminución significativa de la inversión de FinTech en 2016 fue consecuencia particulamente, de una disminución en las fusiones y adquisiciones (F&A) y de los fondos de capital privado (FCP). Sin embargo, es importante reconocer que 2015 fue un año atípico en términos de F&A y FCP, lo que generó los altos valores en las inversiones en el sector.

No obstante, es necesario aclarar que, durante el año 2016, el mercado siguió en movimiento y mantiene su potencial. Si obviamos el comportamiento atípico con respecto al resto de la serie del año 2015, el número de acuerdos siguió creciendo y el entusiasmo por algunas áreas del mercado ayudó a mantener el interés alto de los inversores en las FinTech. En especial las tecnologías de seguros y de reglamentación, la inteligencia artificial, los pagos y préstamos, y el análisis de datos atrajeron la atención de los inversores, con perspectivas positivas de crecimiento en los próximos 12 meses (KPMG, 2017).

A la luz de los datos anteriores, podemos señalar que la innovación financiera generada por el uso creciente de nuevas tecnologías es un factor de cambio en el sistema financiero e inevitablemente su importancia aumentará con el pasar del tiempo. Por ello, la comprensión de estas innovaciones es de vital importancia para una completa comprensión de la estructura y del funcionamiento del sistema financiero, así como del desarrollo comercial futuro de los pagos móviles.

Junto con lo anterior, estas soluciones financieras abren una infinidad de posibilidades para el marketing, si tenemos en cuenta la generación de contenido que suponen. La información es, más que nunca, fundamental y conocer los gustos y preferencias de compras de cada cliente permite al minorista generar un mensaje más asertivo hacia ellos, acercando el cliente al comercio y creando un resultado más eficiente.

De este modo, la implementación del marketing móvil puede ser una decisión estratégica relevante (Störm et al., 2014). La oferta de servicios como programas de fidelización, cupones e informaciones de productos, entre otros, pueden ser importantes motivadores en el proceso de la adopción de las FinTechs.

En este escenario es necesario realizar más análisis en relación con los procesos de adopción de los sistemas de pago, así como hacer un seguimiento de los efectos que las innovaciones FinTech tienen en productos y servicios específicos, en las instituciones financieras establecidas, en los mercados financieros y en la economía global.

Este estudio pretende contribuir a la investigación sobre la adopción de pagos móviles a partir de los factores que influyen en la intención de utilizarlos. Para ello se han desarrollado diversas investigaciones de campo que utilizan el cuestionario como base para la obtención de información de carácter primario, y modelos de ecuaciones estructurales (*Structural Equation Modeling* - SEM) basados en las covarianzas, para realizar los correspondientes análisis de relaciones. Se espera que esta tesis doctoral pueda contribuir, no sólo al avance en las investigaciones científicas relacionadas con las FinTech, sino también para el propio progreso de la industria, ayudando a las empresas e instituciones a entender mejor lo que implica la adopción masiva de los pagos móviles, y cómo dirigirse a los diferentes grupos de consumidores.

1.2 Planteamiento del problema y objetivos de investigación

Aunque muchos expertos afirman que la adopción masiva de los pagos móviles es inevitable, muchas de las soluciones de pago móvil que han sido lanzadas alrededor del mundo en los últimos años están teniendo dificultades para su consolidación definitiva.

La intención de usar una nueva tecnología depende de tres factores principales: las características de la propia tecnología, las características del individuo u organización que toma la decisión de adopción y el sistema social en el que reside el adoptante (Rogers, 2003). Debido a que no tenemos datos sistemáticos sobre los sistemas sociales y las redes de comunicación que conectan las ciudades, enfocamos nuestro análisis en los dos primeros factores.

Por estas razones, el objetivo principal de esta tesis es dar una mayor comprensión sobre los factores que influyen en la intención de los consumidores de utilizar los servicios de pago móvil en un punto de venta (*point-of-sale* - POS). Consideramos que los resultados obtenidos de los diferentes trabajos incluidos en esta tesis doctoral pueden ser relevantes para alcanzar un incremento en el uso de los pagos móviles. De esta forma, el propósito principal de esta tesis es responder a la siguiente pregunta:

¿Cuáles son los determinantes de la intención de los consumidores de utilizar los servicios de pago móvil en el punto de venta?

A raíz de la formulación de esta pregunta, surgen tanto el objetivo general de este trabajo, como los objetivos específicos:

El **objetivo general** de esta tesis es evaluar los factores que determinan la intención de adopción de sistemas de pagos móviles, considerando diferentes tipos de pagos disponibles en el mercado, en diferentes entornos, donde el grado de adopción del servicio es aún reducido.

Los **objetivos específicos** derivados de esta tesis doctoral se circunscriben a 3 tipos de pagos móviles como herramienta de pago en un comercio físico, a la relevancia de este segmento en la industria FinTech, así como en el ecosistema internacional. Más concretamente, planteamos los siguientes objetivos:

- Proponer modelos capaces de explorar la intención de usuarios de teléfonos móviles de usar los diferentes sistemas de pagos utilizando diferentes tecnologías (en concreto NFC, códigos QR y SMS);
- Analizar los determinantes directos e indirectos de la adopción de tecnologías innovadoras (NFC, códigos QR y SMS) usadas en el proceso de pago móvil;
- Explorar como la oferta de servicios móviles integrados al pago móvil afecta a la intención de uso, tomando en consideración los diferentes niveles de innovación personal del usuario.
- Ofrecer estrategias de negocios específicas para cada tipo de pago móvil, para aumentar la adopción de los pagos móviles;
- Conocer el comportamiento del consumidor ante los nuevos sistemas de pagos en diferentes entornos y con diferentes tecnologías;
- Explorar qué aspectos técnicos de los diferentes sistemas de pago pueden ser más o menos importantes para los consumidores;
- Conocer como factores personales relacionados a las nuevas tecnologías influyen en la intención de uso de los pagos móviles;
- Explorar el perfil del futuro usuario de pago móvil y cuáles son las barreras encontradas para el uso de estos innovadores sistemas.

1.3 Limitaciones

Esta tesis doctoral se centra en consumidores de España, Alemania y Brasil. Dicha restricción geográfica puede ser entendida como una oportunidad de investigación en la medida en que sea posible obtener resultados complementarios entre estos tres países, ya que están en

diferentes momentos en cuanto la comercialización del pago móvil. Junto con lo anterior, este trabajo se centra en la intención previa de adoptar los pagos móviles por parte de los consumidores, es decir antes de que el servicio esté disponible a toda la población, por lo que los consumidores que no utilizan smartphones ni tablets han sido excluidos del estudio.

Los factores incluidos en este estudio para explicar la intención de uso, en parte, se basan en estudios previos sobre servicios de pago móvil. Los factores seleccionados en los estudios descritos en esta tesis han sido considerados relevantes para el estudio de los pagos móviles y están totalmente relacionados con la herramienta de pago estudiada y presentada a los encuestados. Además, están entre los determinantes principales de la intención de uso de los servicios móvil, en especial de los pagos móviles. No obstante, algunos factores que pueden ser relevantes en el futuro han sido excluidos. En particular el costo del servicio de pago, ya que hasta la fecha los pocos servicios de pagos móviles ofrecidos en estos países son gratuitos para uso en tiendas minoristas. Otros factores no se han considerado en aras de la operatividad de los diferentes estudios llevados a cabo.

Por último, el pago móvil es un término general que se aplica a los pagos con teléfonos móviles. Por ello cabe señalar que, aunque hay muchas tecnologías que se están desarrollando para que el pago móvil tenga la seguridad y el éxito deseado, este estudio se limita a investigar tres que se utilizan para pagar con el móvil en un comercio minorista: NFC, códigos QR y SMS. Quedan por tanto fuera de este estudio otras tecnologías actuales y futuras que pueden tener también relevancia en el mercado.

1.4 Estructura de la Tesis

Este trabajo de investigación comienza con este capítulo introductorio, y tras él a lo largo del capítulo 2 se pone de manifiesto la importancia que ha supuesto los avances en las tecnologías móviles y la evolución en el uso y en el valor que estos dispositivos suponen actualmente para los consumidores, exponiendo cómo estos cambios han cambiado completamente el escenario económico mundial y han dado origen a innovaciones en soluciones financieras, tanto para empresas como consumidores. También se revisa el origen del pago móvil, se esclarecen los distintos conceptos involucrados al término pago móvil, exponiendo los diferentes sistemas de pagos móviles existentes, con un enfoque mayor en los sistemas con mayor potencial para la

industria FinTech en los próximos años. Para finalizar con este capítulo, se analiza el escenario actual y se proponen posibles evoluciones futuras.

La parte de contextualización de esta tesis doctoral continúa con el capítulo 3, donde se analizan los principales servicios de comercio móvil, complementarios al pago móvil y que pueden contribuir a potenciar éste. En particular se ofrece una clasificación de estos servicios, con ejemplos prácticos de su aplicación, y se analiza el papel que dichos servicios podrían tener como parte del ecosistema de pago móvil.

La parte central de la tesis está conformada por cuatro estudios diferentes relacionados con la adopción del pago móvil desde el punto de vista del consumidor, en tres países diferentes y considerandos tres diferentes tecnologías. El propósito de esta parte es completar el conocimiento disponible sobre medios de pago móviles, y señalar posibles vías de acción para la implantación efectiva de estos medios de pago.

En particular los cuatro estudios se recogen en los capítulos 4 *"User behaviour in QR mobile payment system: the QR payment acceptance model (QRPAM)"*; 5 "*Intention to use new mobile payment systems: A comparative analysis of SMS and NFC payments"*; 6 "*Acceptance of NFC Technology for Mobile Payments: A Brazilian Perspective*" y 7 "*Exploring the Effects of Mobile Services on m-Payments adoption*".

Finalmente, el capítulo 8 ofrece una reflexión conjunta en torno a los resultados obtenidos en los cuatro estudios y una serie de conclusiones de interés tanto para el ámbito académico, como para el empresarial.

La estructura del trabajo que resumida en la Tabla 1.

Tabla 1 - Estructura de la tesis

CAPITULO 1 - Introducción	• Planteamiento del problema y objetivos de investigación • Limitaciones • Estructura de la tesis
CAPITULO 2 – Pagos Móviles: Pasado, presente y futuro.	• El origen de los pagos móviles • Clasificación de los pagos móviles • La actual situación y ecosistema del pago móvil • El papel del blockchain y de las criptodivisas en la evolución del pago móvil • Perspectivas de los pagos móviles
CAPITULO 3 -El papel del marketing móvil para la adopción del pago móvil	• Conceptos de marketing móvil • Clasificación de los servicios móviles • El valor de los servicios móviles para el consumidor
CAPITULO 4 - User behaviour in QR mobile payment system: the QR payment acceptance model (QRPAM)	• Introduction • Theoretical background • Methodology • Research results • Conclusions, future research and managerial implications
CAPTULO 5 - Intention to use new mobile payment systems: A comparative analysis of SMS and NFC payments	• Introducction • Conceptual model and research hypothesis • Methodology: scope of study, measurement scales and data collection • Data analysis, results and discussion • Limitations, conclusion and managerial implications
CAPITULO 6 - Acceptance of NFC Technology for Mobile Payments: A Brazilian Perspective	• Introducction • Literature review • Methodology • Data analysis and results • Conclusions
CAPITULO 7 - Exploring the Effects of Mobile Services on m-Payments adoption	• Introduction • Theoretical Background • Research Methods • Analysis and Results • Conclusions
CAPITULO 8 - Conclusiones	• Conclusiones principales • Implicaciones teóricas • Implicaciones empresariales

Fuente: Autor

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CHAPTER 1

INTRODUCTION

This chapter puts forward the current technological landscape of means of payment, as well as the importance of financial technologies, especially mobile payments, in the framework of society and business. Furthermore, this chapter identifies the potential that financial technologies have in the changing financial and commercial contexts, as well as it importance in the life of consumers. The thesis also raises the research problem, as well as the objectives laid out for the development of the research, as well as the limitations of this collection of four studies. Finally, this chapter summarizes the structure and organization of this doctoral thesis.

The trend of mobile devices is global and irreversible. These devices are increasingly present in our lives and their adoption is growing faster than initially predicted. The development of the offer of these devices and the increase of their use has modified our routines. This trend has been determined in a very special way by the emergence and subsequent evolution of smartphones since they have the ability to add applications that are in constantly developing that solve operations that previously required a greater investment of time. They also allow to optimize and enhance the communication, either as a recipient of news and specific novelties, or as a generator of content in social media.

Recent research conducted and published by Ditrendia (2016) indicates that mobile phone penetration worldwide reached 97% in 2015. This represents an increase of 563 million mobile phones with a total of 7.9 billion devices at the end of 2015. Although smartphone sales are expected to slow down in the coming years due to the maturity of the North American, European and Chinese markets, sales in 2015 throughout the world increased by 13% compared to the previous year.

The study of Ditrendia (2016) also indicates that the regions of the world with the highest mobile penetration are Central and Eastern Europe at 139%, followed by Western Europe and Southwest Asia at 124%, and the Middle East at 123%. Spain is the country with the highest penetration of Smartphones in Europe. In fact, 80% of Spain's population possess a smartphone that they check 150 times a day it on average, and starts to use at the age of 2. The regions with the lowest penetration, by contrast, are South Asia (77%), Africa (82%) and Central America (88%) (Ditrendia, 2016). Figure 1 illustrates the percentage of mobile penetration in the world.

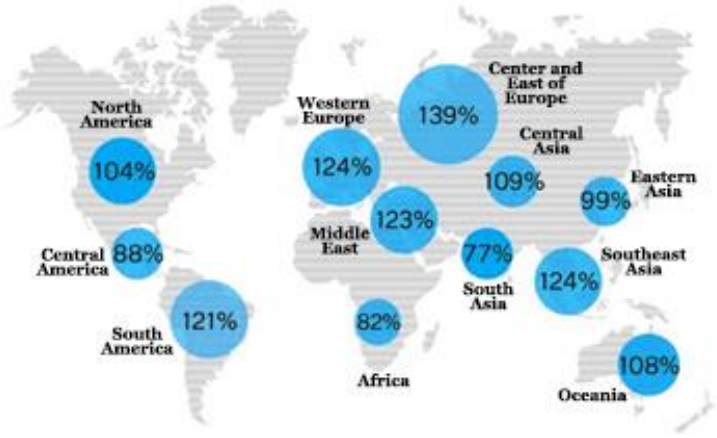


Figure 1 - Worldwide penetration of mobile phones

Source: Ditrendia (2016)

On the other hand, the number of smartphone users is projected to grow. Studies estimate that of the 4.61 billion mobile users in 2016 throughout the world, 2.08 billion are smartphone users. Forecasts for 2019 indicate that this figure will exceed 5.07 billion, of which 2.65 will be smartphones (Ditrendia, 2016).

In this new era in which mobile devices become the center of daily activities, many existing services that were efficient before the existence of these new devices will end, as will all the profound changes affecting social customs (TicWeb, 2016). In the same manner, other services will spring forth and develop in an optimized and innovative way.

Following this trend, the mobile market in recent years has led lenders, banks and technology companies to orient themselves toward the mobile market for future payment solutions. Financial technologies are currently growing exponentially. The FinTech industry which brings together all the financial service companies using the latest technologies to offer innovative financial products and services, currently generates millions of euros that directly influence the financial and technological industry. This importance and financial potential is one reason why the industry is able to change traditional business models in virtually all financial services and functions: banking, insurance, money transfers and payments, market provisioning, investment management, deposits and loans, obtaining capital, etc.

The FinTech industry has begun to have a significant affect on international ecosystems as it has had a major impact on the trends, on the flow of funds between market players, and on the attention of financial control agencies. The Financial Stability Board (FSB), an international body that monitors and makes recommendations on the global financial system, as well as other experts on the subject (Andresen, 2016, Mesropyan, 2016), believe that FinTech has become a vital element for international ecosystems, and will be a clear trend for the future. Figure 2 summarizes some of the reasons that explain the growing importance of FinTech.

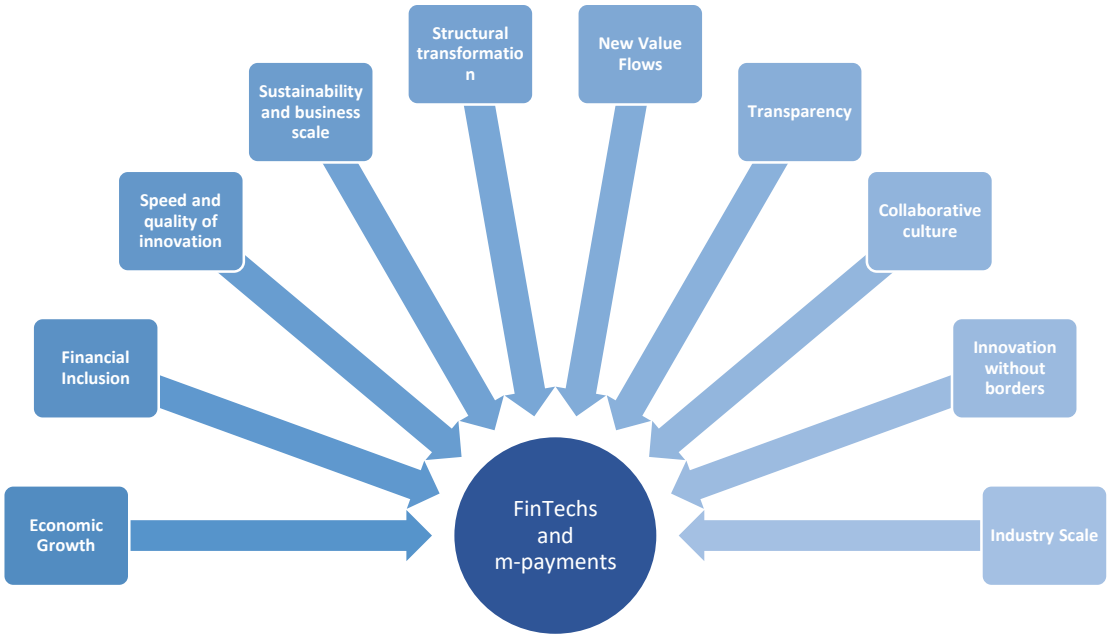


Figure 2 - The 10 reasons that FinTechs are vital to financial market

Source: Author from Andresen, 2016 and Mesropyan, 2016a.

According to Mesropyan (2016a) the segment of payments within the FinTech market is an important element of economic growth, adding value to the GDP of a large number of countries since 2011, generating new jobs and reducing rates of unemployment.

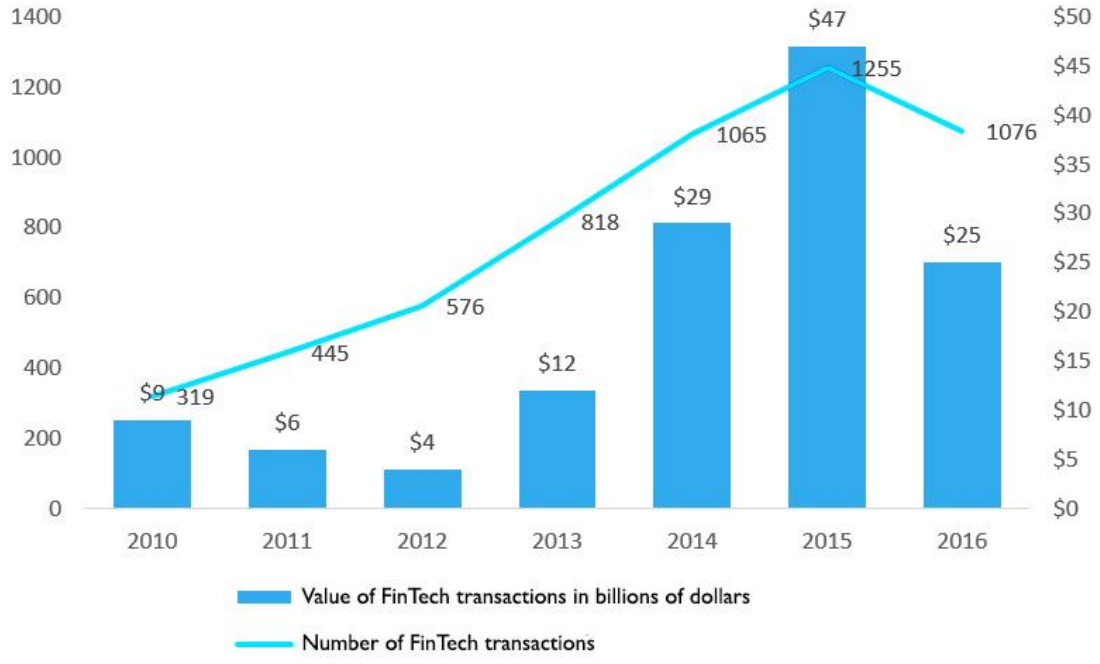
On the other hand, FinTech facilitates structural changes in the market by opening opportunities for groups of people that are "invisible" from the industry point of view or for financial businesses excluded from due to their low volume. It also opens doors to integrating people with few resources in technology, democratizing the financial services industry, and strengthening the position of small FinTech businesses in the ecosystem by enabling them to act independently (Andresen, 2016 and Mesropyan, 2016a).

Furthermore, FinTech companies give rise to improvements in traditional financial processes and promote the replacement of existing systems with new innovative solutions that can deliver benefits to consumers and other sectors of the economy in terms of quality and speed. On the other hand, they allow companies to easily expand their capabilities, operate with greater efficiency and at a manageable scale so as to facilitate business sustainability in the medium and long term.

FinTech allows transactions to be transparent and executed in real time generating new flows of value not only in financial services, but throughout the economy, as in the case of new digital currencies. In their search of new business opportunities, financial institutions are ready to rapidly test new projects to explore new sources of income. The transparency of the payment systems is guaranteed with the increasing implementation of audits on these types of businesses as their market presence increases.

Moreover, FinTech's own operation promotes elimination of international and inter-industry barriers, facilitating a collaborative culture which also generates the exchange of knowledge in innovation.

FinTech has grown in recent years and has gone from being a small-sized or figurative niche to becoming a global and relevant industry with impact. Despite the fact that the industry presented atypical growth in 2015, with an increase of nearly 62% compared to the previous year, 2016 presented a reduction in FinTech investments of 47%, resulting in a total of 24.7 billion dollars.



Bar chart 1 - Total global inversion in FinTech companies

Fuente: KPMG (2017)

The significant decline in FinTech's investment in 2016 was mainly a result of a decline in mergers and acquisitions (M&A) and private equity funds (PEF). However, it is important to recognize that 2015 was an atypical year in terms of M&A and PEF, which generated the high values in the investments in the sector the previous year.

However, it is necessary to clarify that the market in 2016 continued moving maintaining its potential. If we ignored the atypical behavior over the rest of the series of 2015, the number of deals continued to grow and enthusiasm for some areas of the market helped keep investor high interest in FinTech. These included in particular insurance and regulatory technologies, artificial intelligence, payments and loans, and data analysis which attracted the attention of investors, with positive prospects for growth in the next 12 months (KPMG, 2017).

In light of the above, we can point out that the financial innovation generated by the growing use of new technologies is a factor of change in the financial system and inevitably its importance will increase with the passage of time. Therefore, understanding these innovations is vital for a complete understanding of the structure and function of the financial system as well as the future commercial development of mobile payments.

In conjunction with the features mentioned above, these financial solutions open the doors to a multitude of possibilities for marketing if we consider the content they can generate. Information is, more than ever, fundamental and identifying the tastes and preferences of each customer's purchases allows the retailer to generate a more assertive message towards them, bringing the customer closer to the trade leading to more efficient results.

Hence, the implementation of mobile marketing can be a relevant strategic decision (Störm et al., 2014). The offer of services such as loyalty programs, coupons and product information, among others, can be important motivators in the process of adopting the FinTechs.

In this scenario, it is necessary to carry out more analysis on the adoption of processes of payment systems, as well as to monitor the effects that FinTech innovations have on specific products and services, in established financial institutions, in markets Financial and in the global economy.

This study aims to contribute to the research on the adoption of mobile payments based on the factors that influence the intention to use them. For this, several field surveys were carried out using questionnaires as the basis for obtaining information of a primary nature. Structural Equation

Modeling (SEM) based on covariance were applied to carry out the corresponding relationship analysis. It is our hope that this doctoral thesis can contribute not only to advances in scientific research related to FinTech but also to the industry's own progress, helping companies and institutions to better understand the implications of massive adoption of mobile payments and how to target different groups of consumers.

1.2 Problem approach and research objectives

Although many experts claim that mass adoption of mobile payments is inevitable, many of the mobile payment solutions launched around the world in recent years are having a hard time consolidating.

The intention of using a new technology depends on three main factors: the characteristics of the technology itself, the characteristics of the individual or organization adoption the features, and the adopter's social system (Rogers, 2003). Since we do not have systematic data on social systems and communication networks connecting cities, we focus our analysis on the first two factors.

For these reasons, the main objective of this thesis is to offer a greater understanding on the factors that influence the intention of the consumers to use the services of mobile payments at a point of sale (POS). We believe that the results obtained from the different papers included in this doctoral thesis may be relevant to reach an increase in the use of mobile payments. Hence, the main purpose of this thesis is to advance responses to the following question:

> What are the determinants of consumer intention to use mobile payment services at the point of sale?

Following the formulation of the study question emerge both the general objective of this work and its specific objectives:

The **general objective** of this thesis is to evaluate the factors that determine the intention to adopt mobile payment systems by studying the different types of payments available in the market in different environments where the degree of adoption of the service is still limited.

The **specific objectives** derived from this doctoral thesis are limited to three types of mobile payments as a payment tool in a physical business, to the relevance of this segment in the FinTech industry, as well as in the international ecosystem. We propose the following specific objectives:

- Offer models capable of exploring the intention of mobile phone users to use different payment systems using different technologies (specifically NFC, QR codes and SMS).
- Analyses of the direct and indirect determinants of the adoption of innovative technologies (NFC, QR codes and SMS) used in the mobile payment process.
- Explore how the offer of mobile services integrated into mobile payments affects the intention to use, taking into consideration the different levels of user personal innovativeness.
- Offer specific business strategies for each type of mobile payment, to increase the adoption of mobile payments.
- Determine the behavior of the consumer when confronted with the new payment systems in different environments and with different technologies.
- Explore what technical aspects of different payment systems may be more or less important to consumers.
- Determine how personal factors related to the new technologies influence the intention to use mobile payments.
- Explore the profile of the future mobile payment user and what are the barriers encountered for the use of these innovative systems.

1.3 Limitations

This doctoral thesis focuses on consumers from Spain, Germany and Brazil. This geographical restriction can be interpreted as an opportunity of research to the extent that it is possible to obtain complementary results from these three countries since they are currently at different stages regarding the commercialization of the mobile payment. This thesis also focuses on the intention prior to adopting mobile payments by consumers, that is, before the service is readily available to the entire population. Hence consumers who are not users of smartphones or tablets were excluded from the study.

The factors included in this study to explain the intention to use, in part, are based on prior research on mobile payment services. The factors selected in the studies advanced in this thesis are

considered relevant for the study of mobile payments and are directly related to the payment tool under study and presented to the survey respondents. In addition, these factors are among the main determinants of the intention to use mobile services, especially mobile payments. However, some potentially relevant future factors were excluded. This is the case, in particular, of the question of the cost of the payment service since, to date, the few mobile payment services offered in the studied countries are free in retail stores. In addition, in order to maintain the operability of the studies included in this thesis, other factors were disregarded.

To conclude, mobile payment is a general term that applies to payments with mobile phones. It should be noted that, although there are many technologies that are being developed to ensure the security and success of mobile payment, desired security and success, this study limits itself to three types serving to pay with the mobile in a retail store: NFC, QR codes and SMS. Therefore, other current and future technologies that may also have relevance in the market remain outside the framework of this study.

1.4 Thesis structure

This research project begins with this introductory chapter. The following chapter (2) highlights the importance of advances in mobile technologies and the evolution in use and the value that these devices present for consumers. This chapter explains how these changes have completely changed the global economic scenario and have given rise to innovations in financial solutions for both businesses and consumers. Chapter 2 also reviews the origin of the mobile payment, clarifies the different concepts involved in the term mobile payment, and reveals the different existing mobile payment systems, notably those with a more focus on systems with greater potential for the FinTech industry in the coming years. Chapter 2 concludes with an analysis of the current scenario and proposes possible future evolutions.

Chapter 3 continues with the wider framework of this doctoral thesis and analyzes the main mobile commerce services complementary to mobile payment, services that can contribute to enhance mobile payments. This chapter advances a classification of these services and explains the practical examples of their application. It also analyzes the role these services can play in the mobile payment ecosystem.

The central section of the thesis consists of four different studies regarding the subject of the adoption of mobile payment from the consumer viewpoint in three different countries and considering three different technologies. The purpose of this section is to complete the knowledge on the means of mobile payment and to point to possible ways of action for their effective implementation.

The four studies are found in chapters 4, 5, 6, and 7. These are, in corresponding order, "*User behaviour in QR mobile payment system: the QR payment acceptance model (QRPAM);*" "*Intention to use new mobile payment systems: A comparative analysis of SMS and NFC payments;*" "*Acceptance of NFC Technology for Mobile Payments: A Brazilian Perspective;*" and "*Exploring the Effects of Mobile Services on m-Payments adoption.*"

Finally, chapter 8 offers a general reflection on the results obtained in the four studies and a series of conclusions of interest for academia as well as for business.

The structure of the work summarized in Table 1

Table 1 - Thesis Structure

CHAPTER 1 - Introduction	• Problem Approach and research objectives • Limitations • Structure of the thesis
CHAPTER 2 – Past, present and future.	• The origin of mobile payments • Classification of mobile payments • The current situation and ecosystem of mobile payment • The role of blockchain and crypto-currencies in the evolution of mobile payments • Perspectives of mobile payments
CHAPTER 3 – The role of mobile marketing in mobile payment adoption	• Mobile marketing concepts • Classification of mobile services • The value of mobile consumer services
CHAPTER 4 - User behaviour in QR mobile payment system: the QR payment acceptance model (QRPAM)	• Introduction • Theoretical background • Methodology • Research results • Conclusions, future research and managerial implications
CHAPTER 5 - Intention to use new mobile payment systems: A comparative analysis of SMS and NFC payments	• Introducction • Conceptual model and research hypothesis • Methodology: scope of study, measurement scales and data collection • Data analysis, results and discussion • Limitations, conclusion and managerial implications
CHAPTER 6 - Acceptance of NFC Technology for Mobile Payments: A Brazilian Perspective	• Introducction • Literature review • Methodology • Data analysis and results • Conclusions
CHAPTER 7 - Exploring the Effects of Mobile Services on m-Payments adoption	• Introduction • Theoretical Background • Research Methods • Analysis and Results • Conclusions
CHAPTER 8 - Conclusions	• Main conclusions • Implication for management • Limitations and futures lines of research

Source: Author

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CAPÍTULO 2

PAGOS MÓVILES:

PASADO, PRESENTE Y FUTURO

En este capítulo se contextualiza el pago móvil, los conceptos asociados al término, así como las tecnologías más utilizadas para el uso de este sistema de pago. Además, se describe la situación actual de los sistemas de pago móvil, junto con el ecosistema en que se desarrollan estas herramientas de pago. De forma adicional se comenta la relevancia del blockchain en relación con los medios de pago, y más concretamente con su gran potencial para influenciar en el futuro la dinámica de los medios de pagos digitales, en los que se incluye el pago móvil. Finalmente, se exponen las tendencias con mayor potencial de influencia en los próximos años, así como las principales perspectivas futuras de los pagos móviles.

2.1 El origen de los pagos móviles

Para describir el surgimiento de los sistemas de pago móviles, es necesario hacer un breve recorrido por la historia de los medios de pagos, la cual está claramente relacionada con el progreso de la actividad económica. De esta forma, los avances en los sistemas de pago han favorecido históricamente el desarrollo económico, a la par que se puede describir una vinculación también a la inversa: conforme los mercados se desarrollan y modernizan la exigencia de una modernización de los sistemas de pago es creciente.

Siguiendo el esquema propuesto por PwC & IE Business (2015), describimos a continuación los principales hitos en la evolución de los medios de pago a lo largo de la historia, los cuales se encuentran resumidos en la Figura 3.

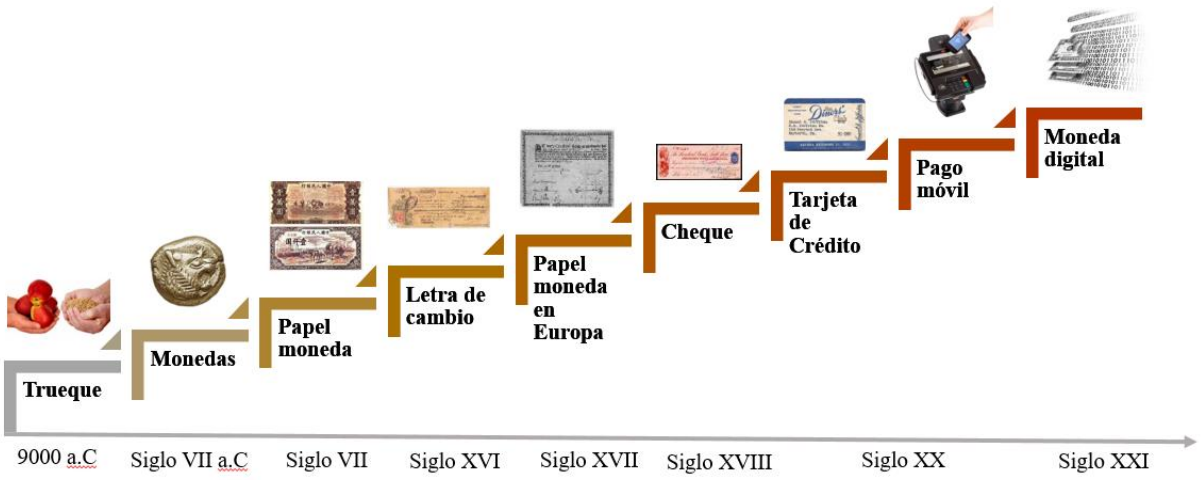


Figura 3 - La evolución de los medios de pago a lo largo de la historia

Fuente: Autor, basado en Romero & Ramos (1973), Kaynak et al., (1995), Dahlberg, et al. (2015), PwC & IE Business (2015), Bitcoin.org (2017).

El método de pago más antiguo del que se tiene conocimiento es el trueque. Este medio de pago dio paso al comercio de mercancías y puso los cimientos para un incipiente sistema económico. No obstante, el trueque presenta inconvenientes importantes, entre los cuales el principal es que para que se llevara a cabo las dos partes de la transacción tenían que querer lo que el otro ofrecía. En los primeros milenios de las culturas agrícolas, las mercancías de mayor valor

eran la sal, las semillas y las conchas. Posteriormente, a partir del siglo VII a.C., se comienzan a utilizar las monedas, lo que permitió realizar intercambios sin necesidad de trueque, y por tanto con la sola necesidad de la confluencia de un oferente y un demandante de un determinado bien o servicio. Las monedas, eran inicialmente una mezcla de oro y plata y se comenzaron a utilizar en Lidia, un reino situado en lo que hoy es Turquía, y del que fue rey Creso, que ha pasado a la historia por su inmensa fortuna.

En el siglo VII d.C. en China, aparecen por primera vez los billetes, o papel moneda, como respuesta a la creciente demanda de monedas, provocada por el crecimiento económico, que hacía cada vez más peligroso y caro su transporte. De esta forma los comerciantes empezaron a utilizar órdenes de pago al portador que podían ser cobradas en otra ciudad. Cuando esos documentos se popularizaron, empezaron a imprimirse y fue así como surgieron los billetes, más tarde emitidos por cuenta del propio emperador, de lo que da fe Marco Polo en algunas de sus crónicas en el siglo XIII. El invento tardó aún varios siglos en llegar a Europa. El primer banco occidental en emitir billetes con respaldo del Estado fue el sueco Riskbank, que lo hizo en 1661.

Poco después, se produjo la generalización en el siglo XVII en Europa del uso de la letra de cambio, documento que es a la vez medio de pago e instrumento de crédito. Su carácter negociable, reconocido desde el siglo XVI en Italia y admitido poco a poco en otros países, fue fundamental para movilizar recursos financieros a nivel internacional y sufragar la revolución comercial del Renacimiento y de los siglos posteriores.

Otro gran avance fue el cheque, que cambió por completo la concepción del medio de pago. No se sabe exactamente su origen, aunque se apunta a Inglaterra en 1780 (Romero & Ramos, 1973). Este medio de pago introduce un elemento de confianza en la transacción, ya que no es un medio de pago con valor intrínseco (como las monedas de metales preciosos), sino un documento por el que el comerciante asume que recibirá lo estipulado, dado que participa una institución bancaria como intermediario para pagar al comerciante en nombre del cliente.

Después del cheque, el siguiente salto tecnológico y de concepto en la historia de los medios de pago fue la aparición de la tarjeta de crédito. Las primeras tarjetas de crédito fueron emitidas en 1914 por la Western Union, en Estados Unidos. Posteriormente, hubo otros intentos, pero la consagración definitiva del dinero de plástico llegó en 1950, cuando Diners Club lanzó una tarjeta con la que se podía pagar en las tiendas y en los restaurantes. La leyenda dice que la idea surgió cuando sus fundadores estaban cenando en un restaurante de Nueva York y descubrieron que no

llevaban dinero para pagar. Verdad o no, lo cierto es que ese fue el germen de la gran revolución del consumo en Estados Unidos en la década de los 50 y de los 60. A la tarjeta Diners Club les siguieron la muy popular American Express, puesta en circulación en 1958 por el Bank of America, y, ya durante los años 60 y 70, Visa y MasterCard expandieron sus operaciones a escala global (Kaynak, Kucukemiroglu & Ozmen, 1995).

Durante los años 90 se registraron grandes cambios y en un corto periodo de tiempo. La aparición de Internet y el desarrollo del comercio electrónico representaron un avance radical en los hábitos de pago, en tanto en cuanto permitía por primera vez hacer operaciones de todo tipo desde el salón de casa.

Las tarjetas de crédito, el efectivo o contrareembolso y las domiciliaciones y transferencias han venido siendo utilizados para realizar pagos en el comercio electrónico desde sus inicios hasta hoy (Rodríguez-Martínez, 2015). Sin embargo, la tarea de mantener la seguridad de las transacciones realizadas en medios electrónicos ha sido un desafío constante, ya que constantemente se producen nuevos ataques. Como consecuencia de esta inseguridad, por un lado, las formas tradicionales de pago se mejoraron para poder ser utilizadas electrónicamente, y por el otro surgieron nuevas maneras de pagar en línea. De esta manera los consumidores pueden utilizar tanto métodos de pago únicamente en línea, como métodos de pago mixto que pueden ser utilizado en línea y/o en el punto de venta.

En 1998, surgió Confinity una plataforma financiera diseñada con el fin de realizar transferencias de dinero a través de PDAs (*personal digital assistant)*, y que rápidamente fue orientada hacia los pagos en el comercio electrónico. Tres años más tarde la empresa pasó a denominarse PayPal, como es conocida actualmente. Su éxito fue arrollador, sobre todo a inicios de la década de 2000. En el 2002 la compañía eBay compró PayPal por 1,500 millones de dólares, en un momento en el que dicho sistema ya representaba un 50% de la forma de pago usada por los usuarios del portal. En ese momento PayPal era el método de pago usado por más de 100 mil usuarios (Inversia, 2016).

Actualmente, PayPal permite a los usuarios enviar pagos de forma gratuita, desde el ordenador o de los teléfonos móviles habilitados para Internet. Se ha convertido en una de las redes principales de pagos globales para sitios web de subastas y cada vez más se usa para la venta de artículos, servicios, viajes, contenidos digitales, así como por otros profesionales que operan fuera de Internet, entre los que se incluyen abogados, contratistas y médicos que también han empezado

a recibir cada vez más pagos en Internet mediante PayPal.[1] La empresa cuenta actualmente con aproximadamente 152 millones de cuentas activas y está presente en más de 203 mercados a nivel mundial. Con la llegada de la tecnología móvil ha impulsado su servicio consiguiendo más de 27,000 millones de dólares en transacciones (Inversian, 2016). De hecho, en 2016 PayPal fue la forma de pago más usada por los internautas españoles para sus compras online (72%) (Statista, 2017).

Desde el nacimiento de PayPal en 1998 o el inicio del micromecenazgo o *crowdfunding* también por esas fechas, se ha producido una auténtica explosión de creatividad y emprendimiento en el sector tecnológico relacionado con las finanzas (BBVA Innovation Center, 2015). Empresas no pertenecientes al sector financiero tradicional, empezaron a utilizar la tecnología para proponer soluciones innovadoras que no solo ofrecen los servicios tradicionalmente asociados a las instituciones financieras, sino que buscan mejorarlos desde una perspectiva centrada en la experiencia del usuario. De acuerdo con BBVA Innovation Center (2015), algunas de esas soluciones y empresas son:

- Pasarelas de pago: Authorize.net, Amazon Payments, Safety Pay, Dwolla, Braintree, Sofort, Facilpay, Trustly, Aplazame; Apple, Google, PayPal, Amazon, y Alibaba ya ofrecen soluciones de pago que reemplazan a las carteras y a las tarjetas de crédito;
- Préstamos - Zopa, Lending Club, y Funding Circle, ejemplos de plataformas peer-to-peer que ponen en contacto a prestamistas y prestatarios;
- Inversiones - robo-advisors como WealthFront, Futureadvisor o SigFig que utilizan algoritmos para dispensar servicios de asesoramiento y gestión de inversiones financieras personales online.

Aunque se tenga la noción de que los pagos móviles son una solución de pago novedosa, para el mercado tecnológico no es realmente así. Los esfuerzos para generar una solución de pago utilizando el móvil como herramienta empezaron también en este período. Específicamente, en 1997, en Finlandia, Coca Cola experimentó por primera vez en el mundo un sistema de pago por móvil que permitía comprar refrescos en una máquina expendedora que procesaba la venta a través de SMS (Dahlberg, Guo & Ondrus, 2015).

[1] https://www.paypal.com/es/webapps/mpp/about

En la década de 2000, los servicios de pago por móvil se convirtieron en una tendencia en el mundo de los negocios, incluso después de la llegada de Internet y su gran éxito (Dahlberg, Mallat, Ondrus & Zmijewska, 2008).En este período se introdujeron en todo el mundo cientos de servicios de pago móvil, aunque muchos de ellos como experimento, incluidos los pagos electrónicos y el acceso a la banca por Internet, y sorprendentemente muchos de estos esfuerzos fracasaron y pocos son los que han sobrevivido al paso del tiempo.

Entre las diferentes soluciones que surgieron en este período, estuvo Google Wallet, que fue una de las primeras empresas en mencionar el término "monedero virtual" para la realización del pago online y en tienda física usando el móvil. Lanzada en 2011 y en funcionamiento hasta hoy especialmente en Estado Unidos, tiene esta última función como principal diferencial, porque permite al consumidor pagar con el móvil con sólo acercarlo al terminal de venta de la tienda.

Como se puede apreciar en algunos de los antecedentes de los medios de pago actuales, las nuevas formas de pago, como los pagos móviles, no son únicamente fruto del constante progreso de las tecnologías de la información, de la comunicación y de la economía, sino que también surgen como respuesta a algunos problemas asociados al manejo de dinero efectivo, como, por ejemplo: 1) la necesidad de abaratar el coste del dinero y de los medios de pagos existentes, 2) dotar de flexibilidad a las pequeñas compras y la realización de pagos instantáneos, 3) aumentar la protección y la seguridad contra el fraude y otras formas de delito, y 4) la presión en el sector financiero por parte de los nuevos requerimientos regulatorios que hacen que éstos busquen formas más rentables de gestión de sus negocios. (Tamayo, 1999; BBVA Innovation Center, 2015).

Desde hace dos décadas, los esfuerzos son continuos para generar un pago móvil efectivo y seguro, ya que los smartphones tienen una presencia cada día mayor en la vida de los consumidores, y las innovaciones tecnológicas que se producen en estos dispositivos no cesan.

Para ello, empresas tecnológicas y financieras invierten en el desarrollo de tecnologías para transmitir datos de pago de manera segura desde el dispositivo de pago móvil al punto de venta comercial (POS). Algunas de las formas de comunicación móvil a TPV que han ido surgiendo incluyen *Magnetic Secure Transmission* (MST), *Near Field Communication* (NFC), *Quick Recognition* (QR) Code, Bluetooth, Bluetooth Low Energy (BLE) y servicio de mensajes cortos (SMS) (ENISA, 2016).

Durante la última década, se han ido lanzando otros nuevos métodos de pago con la finalidad de optimizar el proceso de pago, sea online o físico. De acuerdo con Rodríguez-Martínez (2015) entre estas innovaciones están:

- las tarjetas virtuales, también llamadas de "tarjetas de crédito de un solo uso", diseñada para poder realizar una única transacción online, sin la emisión de una tarjeta física (BBVA, 2015);
- las tarjetas contactless, que permiten realizar el pago con sólo acercar la tarjeta al terminal de punto de venta de un comercio utilizando tecnología NFC;
- las aplicaciones de pago de tiendas, que son las aplicaciones propias de determinados comercios que tiene como objetivo agilizar el proceso de reserva o de compra y así aumentar la eficiencia en el funcionamiento de sus negocios.
- Los pagos móviles, que ganaron nuevos e importantes participantes tecnológicos en el desarrollo del mercado de pagos móviles, como, por ejemplo: Samsung, con el Samsung Pay y Apple, con el Apple Pay,

El último gran hito en la evolución de los medios de pago ocurre en 2008 con la creación de la moneda digital Bitcoin, la primera implementación de un concepto conocido como "moneda criptográfica" (Nakamoto, 2008). Esta fue descrita por primera vez en 1998 por Wei Dai en la lista de correo electrónico "cypherpunks", donde propuso la idea de un nuevo tipo de dinero que utilizara la criptografía para controlar su creación y las transacciones, en lugar de que lo hiciera una autoridad centralizada (Bitcoin.org, 2017). La primera especificación del protocolo Bitcoin y la prueba del concepto la publicó Satoshi Nakamoto en el 2008 en un artículo de investigación en *Cryptography Mailing List* (metzdowd.com). A finales de 2010 Satoshi abandonó el proyecto sin revelar mucho sobre su persona (Bitcoin.org, 2017). Desde entonces, la comunidad ha crecido de forma exponencial y cuenta con numerosos desarrolladores que trabajan en el protocolo Bitcoin. El protocolo Bitcoin y su software se publican abiertamente y cualquier programador en cualquier lugar del mundo puede revisarlo o crear su propia versión modificada del software.

Pero eso ya no es historia. Es el presente y el futuro de los medios de pago.

2.2 Clasificación de los pagos móviles

Las actuales soluciones de pago móviles se basan en el desarrollo tecnológico de los teléfonos inteligentes, permitiendo el desarrollo de aplicaciones de pago que pueden utilizarse de diversas maneras al realizar transacciones de pago con un dispositivo móvil.

Sorprendentemente, hay mucha información errónea sobre lo que son realmente los pagos móviles, lo que acaba generando confusión a la hora de diferenciarlos. Wester (2011) clasifica los sistemas de pago móvil en 5 categorías principales (véase Figura 4).

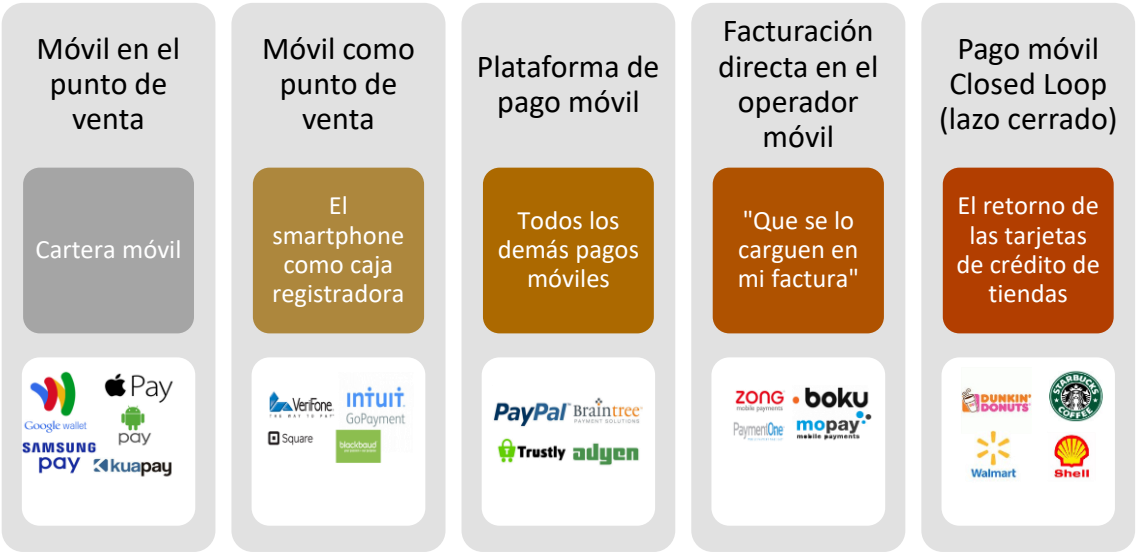


Figura 4 - Categorías de pagos móviles

Fuente: Autor, adaptado de Wester (2011)

El pago móvil en el punto de venta se conoce como carteras móviles. Ese es el tipo de pago móvil más puro. Se produce cuando se utiliza el teléfono móvil para realizar una transacción de pago en un punto de venta para comprar un producto o servicio. Este tipo de pago puede utilizar diversas tecnologías, como la NFC, códigos QR u otro tipo de tecnología "*tap and go*" o similar. Además, estos métodos no incluyen necesariamente solo medios de pago ya que pueden realizar otras funciones y servicios.

El móvil como punto de venta también se considera un tipo de pago móvil, pero en este caso el smartphone funciona como una caja registradora. En este caso los comerciantes utilizan un dispositivo móvil para procesar los pagos que los clientes realizan con tarjetas de crédito. Este método no se debe confundir con las carteras móviles.

Las plataformas de pago móvil incluyen todos los otros tipos de pagos usando el móvil como herramienta. En otras palabras, es todo método que permita a los consumidores enviar dinero a los comerciantes, o incluso unos a otros (a veces llamado P2P), utilizando dispositivos móviles.

Una compra con facturación directa en el operador móvil consiste en que el precio del producto o servicio se añade a la factura mensual telefónica. Normalmente se utiliza en la compra de contenido digital como juegos, apps, etc. Este tipo de pago está creciendo en los últimos años.

Finalmente, el pago *closed loop* o lazo cerrado, son aplicaciones móviles desarrolladas específicamente para una tienda o marca que funciona no sólo como una opción de pago en esta tienda, pero incluye también servicios adicionales vinculados al pago, como aviso de promociones, programas de fidelidad, cupones de descuentos, etc. Son consideradas un nuevo canal de relación con el cliente usando una plataforma móvil que integra tanto el pago en el punto de venta, como otros servicios de marketing móvil. Ejemplo de este servicio, fue el lanzado por Starbucks, realizando 3 millones de transacciones en sus primeros dos meses. La principal característica de esta categoría de pago y que la diferencia de las demás es que el consumidor sólo podrá utilizarla en una determinada tienda y no en varias, como es caso de las anteriores.

Para los propósitos de este trabajo, se ha estudiado el tipo de pago móvil en el punto de venta, a través de un aplicativo móvil que funciona como una cartera virtual. Esta decisión se basa en que: (1) los más importantes jugadores en la carrera del pago móvil, tanto las empresas líderes de tecnología, como una gran cantidad de *startups* tecnológicas, están dedicando todos sus esfuerzos en ofrecer un aplicativo de cartera móvil que incluya todos los demás tipos existentes -tarjetas de crédito, transferencias bancarias entre consumidores y/o negocios, tarjetas de tiendas, programas de fidelización, etc.-, como Google wallet, Apple pay, o Samsung Pay; (2) la adopción de este tipo de pago supone un cambio significativo en la vida del consumidor y en sus decisiones en el proceso de compra por productos y servicios; y (3) este medio de pago proporciona informaciones de fundamental importancia para la optimización de la relación empresa-cliente, así como supone un cambio significativo en la manera como las empresas promueven su marca, sus productos y/o servicios.

De esta forma, para los propósitos de este estudio se considera la siguiente definición de pago móvil (Pousttchi, 2008; Liébana-Cabanillas, Muñoz-Leiva & Sánchez-Fernández, 2015):

> Es un tipo de proceso financiero de naturaleza particular o empresarial, en el cual se utiliza un dispositivo electrónico de comunicación móvil para iniciar, autorizar y realizar una transacción financiera.

2.3 Tecnologías para la realización del pago móvil

En el contexto del pago móvil, definido en los términos introducidos en la sección anterior, se pueden diferenciar diversas tecnologías para llevarlo a cabo. Se han desarrollado muchas tecnologías que tienen como común denominador el afán por conseguir generar una operación financiera segura. Entre estas tecnologías podemos citar las siguientes: Near Field Communication (NFC); Códigos QR y Códigos de barra; Bluetooth; Biométrico; Identificación por Radio frecuencia (RFID); Ondas sonoras y ultrasonido; Banda magnética dinámica; SMS/USSD, Mobile internet o *Emulación Magstripe*.

De entre todas ellas, este trabajo se centra en tres, las cuales son, por otra parte, las tres tecnologías con mayor presencia en el mercado en los últimos 5 años: NFC, SMS y Códigos QR. A continuación, se presenta una breve descripción de cada una de ellas.

2.3.1 El NFC como sistema de pago

Near Field Communication (NFC) es una tecnología inalámbrica de corto alcance que permite el intercambio de datos a 13,56 MHz entre diferentes dispositivos. Dicho intercambio de datos se puede realizar con fines diferentes, entre ellos el pago. Esta tecnología incluye múltiples estándares de comunicación existentes de tarjetas IC sin contacto y está basada en la norma internacional ISO / IEC 18092 (NFCIP-1), pero también es definida por las especificaciones desarrolladas por el NFC Forum, una asociación sin fines de lucro fundada por Nokia Corporation y Sony Corporation. Las especificaciones tienen por objeto asegurar la interoperabilidad entre los dispositivos NFC y entre estos dispositivos y las tarjetas sin contacto (Sony, 2017).

Esta tecnología está atrayendo mucha atención, especialmente porque es un método fácil de usar para intercambio de datos que requiere simplemente aproximar los dispositivos. Además,

las funciones que la tecnología NFC puede ejercer son ilimitadas ya que puede ser integrada en muchos objetos.

Estando integrada a un móvil, puede permitir, además de las funciones de pago, la incorporación de servicios de fidelización, ticketing, identificación, ahorro de tiempo en colas de espera, acceso físico a eventos o edificios privados, acceso seguro a otros dispositivos, intercambio de información entre dispositivos, publicidad en el punto de venta, promociones, uso en transportes públicos, entradas en eventos, programación personalizadas de sensores, descargas de mapas, folletos, tickets, catálogos, etc. (Ver Figura 6).

Figura 5 - Aplicabilidad de la tecnología NFC

Fuente: Autor

Además de su variada aplicabilidad, la tecnología NFC cuenta con otras ventajas, así como algunas características que suponen una debilidad (Tabla 2).

Tabla 2 - Ventajas y desventajas de la tecnología NFC

Ventajas	**Desventajas**
Es un sistema robusto	Tiene un corto alcance de conexión
La comodidad de poder tener la tecnología en el móvil y activarlo cuando el usuario desee	La capacidad de almacenamiento es muy limitada
El tiempo de conexión entre los dos dispositivos es extremadamente rápido (0,1 segundos), y se realiza automáticamente	En la actualidad, la implementación del sistema NFC es costosa
Cuenta con estándares internacionales	La programación en cuanto a hardware y software es compleja
Implementa protocolos de seguridad para transmisiones de datos	La velocidad es más lenta que la del Bluetooth (1-3 Mbit/s), ya que es de 424kbits/s
Permite una mayor eficiencia energética y puede ser utilizada sólo cuando necesaria.	La penetración de smartphones de última generación con chips NFC aún es muy baja en algunos países
Fuente: Autor	

La operatoria con dispositivos NFC depende de la cantidad que suponga el pago. Para valores inferiores a 20 euros, el comerciante teclea el importe de la operación en el TPV. Entonces el cliente acerca la tarjeta al TPV, y se indica el resultado de la operación en la pantalla, y automáticamente se imprime una copia para el comercio. Para compras superiores a 20 euros, la operación es la misma, pero en este caso es necesario que el cliente teclee en el TPV su PIN para validar la operación. Entretanto, es posible cambiar el sistema de petición de PIN, de manera que en lugar de pedirlo para compras superiores a 20€, se lo pida sea cual sea el importe.

Actualmente la tecnología NFC está siendo ampliamente utilizada en las tarjetas de crédito, especialmente en España. De acuerdo con Visa Europe (2016) el uso de este tipo de tecnología no deja de crecer. En un periodo de 12 meses (abril de 2015 a abril de 2016) Visa Europe ha llevado a cabo tres mil millones de transacciones *contactless*, triplicando la cifra del mismo período del año anterior. Sólo el mes de abril de 2016 los europeos usaron sus tarjetas *contactless* 360 millones

de veces, lo que significa cerca de 140 transacciones por segundo con un aumento de 150% desde abril del año anterior (Visa Europe, 2016).

Por otro lado, es posible que la tarjeta *contactless* sea una manera de familiarizar a los consumidores con la tecnología NFC, para que de esa forma la adopción del sistema en teléfonos sea más rápida ya que existe un cierto conocimiento de la herramienta.

A pesar de tener muchas ventajas, el NFC se ha enfrentado en los últimos años a problemas de seguridad. Especialmente en entornos de comunicación inalámbrica abierta (Su, Xu & Qi, 2016; Fan et al., 2016). En el momento en el que se produce el intercambio de información entre dispositivos estos quedan vulnerables a cualquier ataque externo contra la seguridad de la transacción, lo que podría provocar la filtración no autorizada de información personal y pérdida de privacidad del usuario. No obstante, hay diversas propuestas para para solucionar estos problemas y hay muchos equipos dedicados a desarrollar maneras eficaces de asegurar la seguridad de los usuarios (Fan et al., 2016; Park & Lee, 2016), lo que nos muestra que la tecnología NFC aún está en desarrollo en lo que se refiere a un medio de pago móvil.

La eficiencia energética, la seguridad en constante desarrollo y su amplia aplicabilidad en el mundo real son tres de las ventajas más importantes que el NFC tiene sobre otras tecnologías de comunicaciones inalámbricas, lo que permite sin duda crear nuevos estándares en la comunicación inalámbrica y pone esta tecnología como una de más prometedoras en el mercado de las aplicaciones de pago móvil en el futuro.

2.3.2 Los Códigos QR como sistema de pago

Los llamados códigos QR (*Quick Response*), son códigos bidimensionales desarrollados por Denso Wave con el objetivo de ser un símbolo fácilmente interpretable por un escáner, robusto frente a errores y capaz de encriptar todo tipo de información en diversos lenguajes (Denso Wave, 2000). La información es codificada dentro de un cuadrado de tamaño variable, permitiendo almacenar gran cantidad de información alfanumérica, que puede ser interpretable desde cualquier ángulo. Por otro lado, los códigos QR son, fácilmente generables y con multitud de aplicaciones (Códigos-qr.com, 2016).

Desde que Denso Wave, que tiene la patente de los códigos QR, ha hecho la tecnología disponible públicamente, cualquier persona puede crear un código QR y compartirlo. Por eso la generación de estos códigos es fácil, existiendo una gran variedad de programas que, de manera

sencilla, permiten añadir todo tipo de información al código QR, elemento que siendo estático enlaza con información que puede ser tanto estática como dinámica.

Aunque fue originalmente diseñado para el uso en la industria automotora, todo tipo de empresas están utilizando códigos QR, y específicamente como una herramienta adicional en campañas publicitarias. En la tabla X se puede visualizar algunas de las ventajas y desventajas que poseen los códigos QR.

Tabla 3 -Ventajas y desventajas de los códigos QR

Ventajas
Es una solución rentable y fácil de implementar para pagos móviles por proximidad en tiendas
Permite generar a la empresa información y datos de usuarios para uso en estrategias de marketing
Es una tecnología bastante económica
Posibilidad de uso en cualquier teléfono con cámara
Capacidad de actualización inmediata de la información presentada
Compatibilidad con diferentes sistemas operativos (Android, iOS, Windows)
Inconvenientes
Limitada cantidad de información que se puede integrar en un código
Es necesario descargar una aplicación en el teléfono para leerlo
Hay que pasar por muchos etapas para concluir una operación
La iluminación deficiente, superficies reflectantes y daños en pantalla pueden hacer que el código sea ilegible
La seguridad puede quedarse comprometida únicamente con la lectura de un código QR malicioso que no puede ser identificado hasta que se lo escanee.
Fuente: Autor, Villena (2013), Singh (2016) y nearfieldcommunication.org (2017)

La principal ventaja de los códigos QR frente a las demás tecnologías de proximidad es su asequibilidad, está disponible para cualquiera y, además de fácil, es barato generar un código, lo que supone una manera rentable de implementar soluciones de pagos móviles y otros servicios asociados (promociones, información, descuentos, etc.) en el punto de venta.

Entre sus limitaciones principales está el propio proceso de pago ya que, aunque sean llamados "códigos de respuesta rápida", lo cierto es que toman un tiempo para ser escaneado. La operatoria más sencilla de pago mediante QR sería la siguiente: 1) el cliente saca su teléfono, abre la aplicación de pago, 2) elige pagar mediante un código QR y se abre automáticamente la cámara del teléfono (que puede tardar unos segundos dependiendo del dispositivo), 3) apunta la cámara hacia el código y escanea el código con manos firmes 4) digita un PIN de confirmación de la compra y 5) espera el pago ser procesado. Todo este proceso se convierte en tedioso, sobre todo si la comparamos con las demás alternativas de pago, inclusive las tradicionales (tarjeta o efectivo).

En relación con la seguridad del proceso, y dado que los códigos QR son solamente de lectura mecánica, un código QR malicioso seria visto completamente normal para el ojo humano, y es tan fácil crear un código idóneo como crear un código malicioso. Así que, dependiendo del proceso de pago, el cliente puede escanear un código manipulado sin darse cuenta. Ello ha llevado a que por ejemplo el Banco Popular de China, prohibiera los pagos de código QR en 2014, alegando motivos de seguridad y la falta de regulación en la industria, si bien están a punto de liberar nuevas regulaciones que estandarizan la seguridad entre los diferentes productos de pago con código QR en el mercado chino (Singh, 2016).

En cuanto a su aplicabilidad, estas pueden ser bastante variadas. Entre ellas se incluyen campañas publicitarias en el sector textil, como los *outdoors* de Calvin Klein con un código QR que direcciona al cliente al nuevo anuncio de la marca; comunicaciones móviles como la incluida en las cajas de condones de Durex que llevaba al consumidor a descargar un aplicativo que simulaba la experiencia de tener un bebe para fomentar el uso de su producto; señalización en medios publicitarios con códigos que despertaba la curiosidad del cliente por conocer mejor los productos de lanzamiento de marcas como Volkswagen, H y M, Mango; trazabilidad de productos y programa de fidelidad como el lanzado por Danone, que además de ofrecer al cliente informaciones nutricionales y de producción del producto, también les permite acumular puntos por cada código escaneado, que posteriormente pueden ser cambiados por productos de un catálogo de la marca.

En lo que respecta a los pagos móviles, hay múltiples sectores en los que se están implementando estas soluciones. Para nombrar sólo unos pocos, Barclays (Barclays Pingit QR code) ha desarrollado un sistema que permite a sus clientes introducir un código QR en sus facturas para facilitar los pagos, mientras que Mastercard ofrece un nuevo servicio de pago sencillo y

racionalizado. En el negocio de restaurantes, Starbucks (Figura 6), Mc Donalds, Burguer King, KFC, Telepizza y Taco Bell, entre otros, ofrecen un sistema de pago basado en QR, en algunos de sus establecimientos, mejorando así el servicio en el punto de venta. Y en el sector de ventas al por menor, Carrefour ha comenzado a utilizar los códigos QR para unirse a los servicios de pagos de Apple Pay.

Durante los últimos años, el uso de estos códigos ha sido creciente. Un estudio realizado por ScanLife (2016) en varios países mostró que durante el tercer trimestre de 2015 se escanearon cerca de 23 millones de códigos, brindando a los usuarios móviles acceso instantáneo a información sobre productos, ahorros, entretenimiento de video, aplicaciones para móviles y mucho más. Un aumento bastante significativo comparado con los 21.8 millones de escaneos durante el primer trimestre de 2014.

No obstante, aunque se han desarrollado maneras creativas de usar códigos QR para mejorar el compromiso del cliente con las marcas, en Europa, y particularmente en España, la introducción de esta tecnología se encuentra en una etapa no tan evolucionada (Sanz-Valero, Álvarez Sabucedo, Wanden-Berghe, & Santos Gago, 2016) y todavía se enfrentan al problema de la falta de conocimiento por parte de los consumidores, especialmente de las personas poco inclinadas a las tecnologías (Singh, 2016).

Sin embargo, los códigos QR tienen un gran potencial ya que 1) el 80% de la población tiene un teléfono móvil habilitado para utilizar esta tecnología; 2) en 2018 se espera que el número de usuarios móviles alcance los 5,59 miles de millones de los cuales 2,73 serán usuarios de smartphones; y 3) las tablets, que también están en su mayoría habilitadas para escanear estos códigos, también continuarán su crecimiento, esperando superar en 2017 los mil millones de unidades vendidas (Ditendria, 2016).

Además, los códigos QR cuentan con el beneplácito de comercios y otros prestadores de servicios (restauración, hoteles, entre otros) por la facilidad de generación de códigos y bajos costes de implementación para pequeños y medianos negocios. Estas razones explican que esta tecnología se mantenga en el mercado y siga en desarrollo para ofrecer al cliente una experiencia de pago más satisfactoria.

Figura 6 - Pago móvil de Starbucks usando códigos QR

Fuente: China Internet Watch (CIW, 2016)

2.3.3 El SMS como sistema de pago móvil

Short Message Service (SMS) o servicio de mensajería corta, es el nombre dado al servicio de envío de mensajes con hasta 160 caracteres entre teléfonos móviles (Okazaki & Taylor, 2008).

Aunque hoy en día podemos contar con muchas herramientas para comunicarnos, la mensajería corta de las redes móviles tiene una cantidad de beneficios que permiten mantenerlo como una de las opciones de comunicación. En la tabla 4 se describen sus principales ventajas y desventajas:

Tabla 4 - Ventajas y desventajas del SMS

Ventajas
Es rápido y fácil de usar.
No es necesario acceso a internet, pues funciona con proveedores de GSM/CDMA
Todos los teléfonos móviles son compatibles con este servicio
Es un buen método para realizar micro pagos
Pueden ser globalmente usados
No se liberan datos personales o detalles de la cuenta.
Inconvenientes
Escasa fiabilidad: los pagos por SMS de transacción más elevadas pueden fallar fácilmente a medida que los mensajes se pierden
Velocidad lenta: el envío de mensajes puede ser lento y puede tardar horas para que un comerciante reciba el pago
Seguridad: El cifrado SMS / USSD termina en la interfaz de radio, por lo que el mensaje es un texto plano
Alto costo: El costo de configurar códigos cortos, pagar por la entrega de medias a través de un SMS y tener un soporte al cliente para dar cuenta del gran número de mensajes generados que se pierden o se retrasan puede ser bastante alto.
Tasas de pago bajas: los operadores también ven altos los costes de funcionamiento y de apoyo a las transacciones de pagos, lo que resulta en tasas de pago al comerciante por debajo de 30%, siendo normalmente de alrededor del 50%.
Bajo seguimiento de ventas: es muy difícil recordar dónde se compró algo o cómo comprar de nuevo
Fuente: (Arjunwadkar, 2015)

Como ya mencionamos anteriormente, fue por SMS como se realizó el primero pago móvil, en 1997, y en una máquina expendedora de Coca-Cola. La operatoria del pago con SMS es la siguiente: 1) los compradores envían un mensaje de texto para pagar un artículo o servicio; 2) Este mensaje de texto se envía a los proveedores de pagos móviles. De esta forma se evitan los intercambios de informaciones privadas relacionadas a la transacción entre el comprador y el

vendedor; 3) El costo de la compra se agrega a la factura telefónica mensual o se deduce de un saldo prepago proporcionado por el operador de telefonía móvil.

Mediante el uso de pagos por SMS, los usuarios de teléfonos móviles pueden pagar de manera segura y rápida a los comerciantes, comprar bienes o servicios, reales o virtuales, así como realizar depósitos o enviar remesas. Este tipo de pago es particularmente popular en diversos países de África, donde se encuentran grandes poblaciones de personas no bancarizadas, donde el uso de dinero en efectivo puede ser frecuente pero riesgoso, la penetración de smartphones es baja y el acceso a internet es escasa (Fernández, 2015; Lowry, 2016).

En los Estados Unidos, los pagos SMS han tenido mucho éxito en campañas de recogida de fondos como las contribuciones políticas o las contribuciones a ciertas iniciativas de la Cruz Roja, mientras que el uso de pagos por SMS para las transacciones cotidianas ha tenido menos desarrollo (Roberts, 2016). Por otro lado, ha habido problemas con la protección de los consumidores en relación con los pagos por SMS que se incorporan directamente en las facturas de teléfonos móviles. De hecho, y debido a las incidencias de cargos no autorizados a terceros en la factura telefónica de sus clientes, las principales operadoras de telefonía móvil en los Estados Unidos han dejado de ofrecer el servicio (Lowry, 2016).

Aunque los pagos por SMS tienen sus puntos débiles, muchas empresas han aprovechado sus ventajas para proporcionar servicios convenientes a sus clientes. Ejemplo de ello son las máquinas expendedoras en Europa que permiten comprar una Coca-Cola utilizando el pago por SMS, o las que permiten comprar sellos postales y libros en Dinamarca, hamburguesas en Finlandia y billetes de viajes en Tokio, Paris y Roma utilizando este método de pago (Roberts, 2016).

2.4 La actual situación de los pagos móviles

El dinero en efectivo aún es el medio de pago más usado en el mundo. De acuerdo con PwC and IE Business (2016), en el mundo el 85% de las transacciones y el 60% del valor de las mismas se realizan con dinero efectivo (véase gráfico 2). El dinero en efectivo sigue siendo atractivo porque proporciona múltiples beneficios al pagador, incluyendo el anonimato y la gratuidad. Aunque se utiliza principalmente para transacciones de bajo valor, los hábitos culturales y las infraestructuras de pago anticuadas siguen contribuyendo a su uso (Capgemini & BNP Paribas, 2016).

No obstante, la perdurabilidad del hábito de pagar en efectivo no significa que el mercado esté inmóvil. A medida que aumenta la adopción de sistemas e instrumentos de pago digitales, la

proporción de los volúmenes de pagos en efectivo como porcentaje del volumen total de pagos en la mayoría de los países está disminuyendo (Capgemini & BNP Paribas, 2016), pese a que los avances tecnológicos y operativos, como la banca electrónica, han simplificado y facilitado algunos de los métodos tradicionales de pago (PwC & IE Business, 2015).

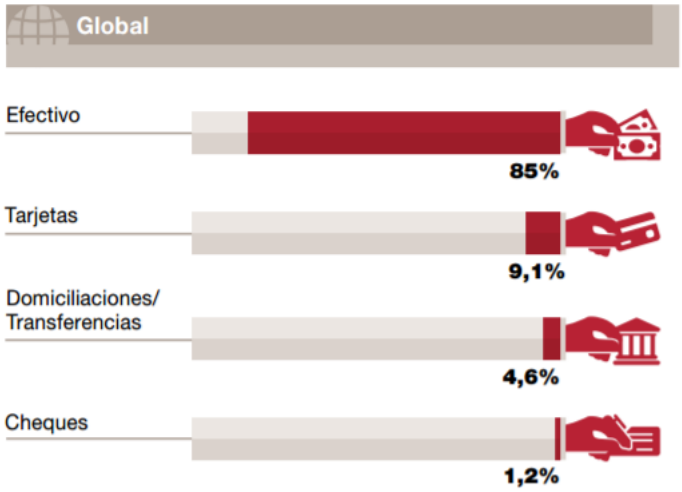


Gráfico 2 - Uso de los medios de pago tradicional en el mundo

Fuente: PwC & IE Business, 2015

Entre los nuevos medios de pagos electrónicos están los pagos móviles, que empiezan a aparecer entre las estadísticas de uso de los diferentes medios de pagos existentes actualmente.

En Kenia más de 22 millones de personas están registradas para pagar sus compras y suministros con el móvil (Communications Authority of Kenya - CAK, 2015). Lo hacen como clientes de la empresa M-Pesa, una filial de Vodafone, y pagan a través de SMS, ya que la mayoría de la población no dispone de un smartphone ni de conexión a Internet. Sin embargo, aunque iniciativas semejantes a la de Kenia ha sido implementada en los países vecinos, el éxito no ha sido, ni mucho menos, el mismo (Uwamariya, Michalik, & Loebbecke, 2016).

En España, como en la mayoría de países occidentales, aunque se dispone de un mejor acceso a la tecnología, el pago con el móvil aún no es uno de los métodos de pago principales. Un estudio reciente desarrollado por PwC en España, ha encontrado que, aunque predominan los métodos de pagos tradicionales, las personas ya empiezan a introducir de manera cotidiana métodos

más innovadores de pago (véase gráfico 3), en especial los consumidores más jóvenes. El estudio también muestra que la evolución futura de los sistemas de pagos móviles estará condicionada por dos grandes elementos transversales: la seguridad y la regulación (PwC & IE Business, 2015).

La seguridad es un factor importante, ya que ningún medio de pago nuevo puede prosperar si el usuario no está convencido de que su dinero no corre peligro. La regulación, por su parte, enfrenta problemas para unificarse, debido a su gran impacto en los modelos de negocio, su desarrollo en distintas capas (sectoriales, de canal, de producto, etc.) y su fragmentación geográfica.

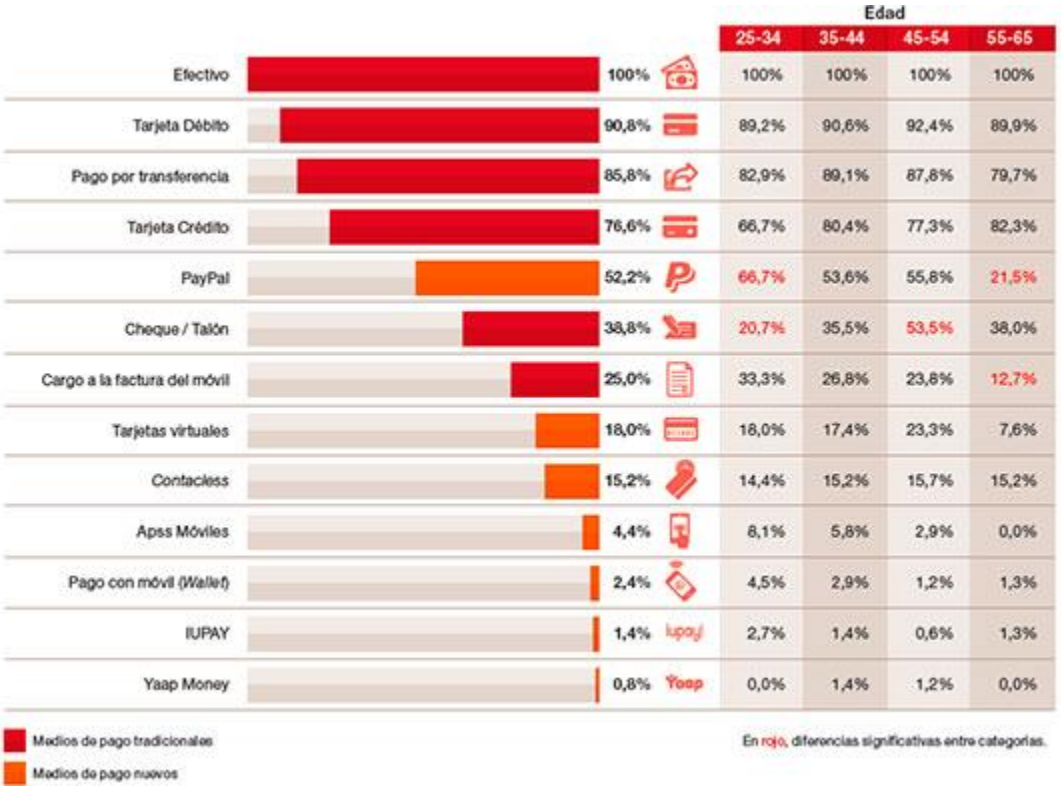


Gráfico 3 - Medios de pagos que se usan en España

Fuente - PwC & IE Business, 2015

A lo largo de 2015, tres grandes empresas de tecnología han realizado esfuerzos para fomentar sus soluciones de pago móvil en el mercado, consiguiendo de manera efectiva una respuesta importante por parte de la industria: Apple Pay tuvo su primero año completo en el mercado, Samsung lanzó su propio servicio de pago (Samsung Pay) y Google ha relanzado su cartera móvil como Android Pay.

Lo anterior ha sido un revulsivo importante para la adopción de medios de pagos móviles. Después de que estas tres empresas presentaran sus sistemas de pago, los usuarios han demostrado un mayor interés en realizar pagos móviles, o al menos en conocerlos mejor. En 2014 el Bank of America anuncio 800.000 usuarios activos de Apple Pay, con 1.1 millones de usuarios registrados. Por su parte, en 2015 Chase Bank comunicó más de 1 millón de usuarios de Apple Pay, y en 2016, cuando se lanzó Apple Pay en China, en la primera hora después del lanzamiento ya había 10 millones de usuarios registrados (Anderton, 2016).

El potencial de los pagos móviles también ha sido percibido por lo bancos de todo el mundo, los cuales están así mismo uniendo fuerzas para fomentar la industria del pago móvil. De acuerdo con Schafer (2016), a finales de 2014 sólo había 7 bancos que daban soporte al pago móvil, y a finales de 2015 se sumaban 55 bancos en todo el mundo que ofrecían estos servicios o estaban empezando a ofrecerlos.

Otra tecnología con gran potencial, y que ha recibido especial atención en los últimos años, son los *wearable*. Esta tecnología forma parte de la gran ola de "Internet de las cosas" o IoT (*Internet of Things*), que es un concepto que se refiere a la interconexión digital de objetos cotidianos con internet.

La tecnología *wearable* comprende los dispositivos tecnológicos que están diseñados para ser usados por las personas como parte de su vestimenta o como un complemento a ésta: gafas, relojes, auriculares y audífonos, monitores de actividad física (*fitness and healthcare trackers*), joyas y moda en general. En un reciente informe de IDTechEx, Hayward, Chansin, & Zervos (2017) afirman que el mercado tendrá un valor de más de 30.000 millones de dólares en 2016, y crecerá en tres etapas: un 10% anual a más de 40.000 millones de dólares en 2018, pero luego se acelerará al 23% hasta más de 100.000 millones de dólares en 2023, y desacelerándose al 11% para alcanzar más de 150.000 millones de dólares en 2026.

En el último par de años una multitud de dispositivos wearables han sido lanzados con la promesa de cambiar la forma en que percibimos e interactuamos con la tecnología. Y frente a este hecho, los interesados en fomentar el pago móvil han buscado unir la conveniencia de esta tecnología con los sistemas de pago móviles, creando de esta manera dispositivos de pago usables (*wearable payments devices*).

En 2016, el proveedor de seguridad digital Gemalto anunció que su pulsera sin contacto Celego, para pagar billetes de transporte, había ganado un premio de Juniper Research. La pulsera

ha sido implementada en el torneo de fútbol Euro 2016 en Lille, y en el club de rugby sarracenos, cuyos aficionados pueden utilizar las pulseras para la alimentación y servicio de bebidas en el estadio Allianz Parque del club (Gemalto, 2016a). En este mismo año, la empresa anunció también su colaboración con RioCard, operador de venta de billetes de transporte público de Río de Janeiro, para poner en práctica las pulseras sin contacto de títulos de transporte públicos (Gemalto, 2016b).

Este tipo de solución de pago, permite que se realicen micro pagos con un simple movimiento de acercamiento de la muñeca a los lectores sin contacto. Los beneficios que se pueden derivar de ello es un aumento de la velocidad de las transacciones y la simplificación de la logística del viaje, construyendo una base sencilla, cómoda y segura para los pagos sin contacto.

Después del lanzamiento del reloj inteligente de Apple en 2014, el Apple Watch, muchos han sido los aplicativos creados a lo largo de dos años para usarse con él. Entre ellos quizás el más relevante sea el Apple Pay, que empezó a ser comercializado en 2015. Actualmente, es posible pagar con el Apple watch a través del Apple pay en 13 países: Australia, Canadá, China, España, Estados Unidos, Francia, Hong Kong, Japón, Nueva Zelanda, Reino Unido, Rusia, Singapur y Suiza (Apple, 2017).

Samsung también ha entrado en esta disputa y ya permitía que los usuarios de dispositivos Android pagaran con el móvil y con el reloj inteligente de la marca, el Samsung Gear S3, en Corea, Estados Unidos, China, España, Singapur y Australia (Samsung, 2017; El economista, 2016b).

Yendo más en el tema de la relación wearables y pagos móviles, hay diversas soluciones lanzadas especialmente en el último año. Algunas de ellas han recibido mayor atención en 2016, entre ellas están las citadas anteriormente, pero hay empresas que van más allá de los relojes inteligentes, algunas empresas han podido ofrecer soluciones de pago bastante interesante. Microsoft, por ejemplo, permite a los usuarios de su monitor de actividad física, el Microsoft Band 2, pagar en Starbucks. En Estados Unidos, con la pulsera de monitoreo de actividad física Jawbone UP4, ya es posible pagar con American Express en los comercios colaboradores, la tarjeta Amex, finalmente, se autentica a través de la aplicación Jawbone solo con deslizar la muñeca en el TPV – con o sin teléfono.

En el sector bancario, el banco que quizás más ha innovado en el tema de los *wearables payments devices*, es Barclays. Que permite que sus clientes, o los clientes de cualquier otro banco que posea la app de pago bPay, paguen por productos y servicios en Reino Unido usando una chaqueta de la marca Lyle & Scott (véase figura 7) o bisuterías de Topshop cuentan por su parte

con un chip sin contacto integrado para pago y que está vinculado al aplicativo bPay (Barclaycard, 2016).

Figura 7 - Pago con bPay con una chaqueta de Lyle & Scott

Fuente: Barclaycard (2016)

2.5 El actual ecosistema de los pagos móviles

Los cambios que se están produciendo en el sector de los medios de pagos no son solo tecnológicos, económicos o de mercado. Van más allá, y afectan a la esencia misma del intercambio.

Para comprender el ecosistema móvil, es necesario comprender adecuadamente los modelos de negocios utilizados por las entidades financieras y demás participantes.

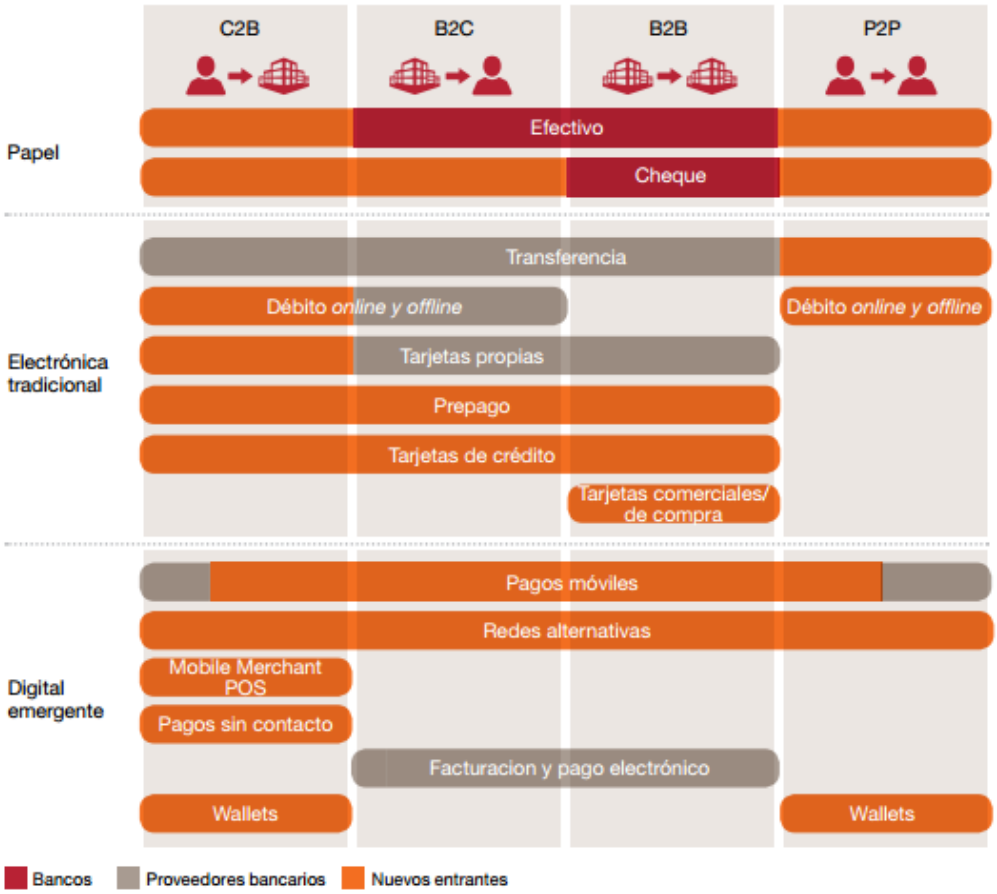
En el pasado, con los productos financieros tradicionales, la estrategia de mercado estaba orientada al producto. El cliente era un elemento más en el flujo de la transacción. Los pagos por tarjeta, por transferencia o mediante domiciliación bancaria estaban regulados de tal forma que los bancos tenían una importancia decisiva en todas las fases del proceso, y eran capaces por tanto de generar importantes ingresos por su participación en el mismo.

En el sistema tradicional de medios de pagos (dinero en efectivo, cheques, tarjetas, transferencias, etc.) la hegemonía de las entidades bancarias era muy clara. No obstante, con el pasar del tiempo fueron entrando en acción nuevos competidores, enfrentándose con las entidades financieras en las áreas del negocio bancario tradicional. Actualmente, se observa que aún existen áreas del negocio tradicional que están en disputa y, además, se ha creado un nuevo territorio de ingresos (lo que se denomina "digital emergente") que ofrece oportunidades para todos (véase tabla 5).

Los constantes cambios en las preferencias de los consumidores han sido claves para que el escenario sea más diversificado. Con el pasar del tiempo, el consumidor dispone cada vez más de información diversificada y eso cambia completamente la manera en que toma sus decisiones. Son más exigentes y capaces de influir aún más en las decisiones de sus amigos y familiares. Ahora, los negocios son direccionados al cliente y para atender a esa demanda, ha surgido un escenario más diversificado, con nuevos jugadores e innovadores servicios financieros, y todos ellos giran en torno a las necesidades del cliente.

De esta manera, el nuevo sistema deja múltiples huecos para la desintermediación, abre la puerta a nuevos competidores, da oportunidades para ofrecer otros servicios en un plano de igualdad, rebaja los márgenes y en definitiva sugiere que los modelos de negocio tendrán que cambiar a fondo para adaptarse a las nuevas realidades del sector (PwC & IE Business, 2015).

Tabla 5 - Actual escenario con nuevos medios de pago



Fuente: (PwC & IE Business, 2015)

El sector digital emergente que surge con nuevas propuestas que están revolucionando el mercado, merece especial atención por su relevancia y participación innovadora en el escenario de los medios de pago. De acuerdo con B.I. Inteligence (2016), "hemos entrado en la era más profunda del cambio para las empresas de servicios financieros desde que la década de 70 nos trajo los índices de fondos mutuos, corredores de descuento y los cajeros automáticos" y eso ocurre especialmente por el surgimiento del segmento digital emergente.

Dentro de dicho segmento, están incluidos todos los servicios financieros accedidos realizados desde un teléfono móvil, entre ellos las carteras móviles y por supuesto, el pago móvil, tanto online como en un punto de venta. El subsegmento de los servicios financieros móviles, o dinero móvil, posee un ecosistema proprio, ya que incluyen servicios diferentes y necesitan la

colaboración de actores diferentes. De acuerdo con Shrier, Canale & Pentland (2016) este ecosistema cuenta con 5 participantes principales, pero no se limita a ellos:

Operadores de Red Móvil (MNO) y Proveedores de servicio de comunicación: Proporcionan el servicio de comunicaciones y la infraestructura para su funcionamiento. En algunas regiones, donde están legalmente autorizadas, entran en el ámbito financiero mediante la emisión de dinero electrónico y la oferta de servicios de pago. Además, algunos están sirviendo como asesores en estrategia móvil para las industrias que son nuevas en este ámbito (véase figura 12).

Bancos y Empresas FinTech: Crean y ofrecen servicios bancarios que están disponibles para móviles. Las *startups* de FinTech han sido capaces de moverse más rápido que los bancos tradicionales, pero ambas son responsables de ofrecer experiencias financieras, así como apoyar y empujar nuevas ofertas de servicios bancarios.

Agentes e Intermediarios: A menudo son el punto de contacto con el consumidor, y por lo general son la cara del dinero móvil que se oferta. Realizan principalmente funciones operacionales para el funcionamiento del servicio, como aperturas de cuenta y gestión de transacciones.

Minoristas y Empleadores: Pueden realizar pagos para transacciones de empresa a consumidor (B2C). Esta categoría puede ser amplia, abarcando desde compras en tiendas hasta pagos de facturas de servicios públicos y cheques de pago, así como transacciones B2B.

Reguladores: Procuran proporcionar un marco regulatorio que proteja a los individuos y ofrezca estabilidad al sistema financiero, al mismo tiempo que proporciona un ambiente favorable a la innovación. En este punto, los reguladores de telecomunicaciones y financieros tendrán que colaborar.

En lo que se refiere al objeto de esta tesis doctoral, no cabe duda que para expandir el mercado de los pagos móviles es fundamental crear un alto grado de interconectividad entre los interesados en fomentar este servicio, de manera que se involucren a escala mundial a diversos actores, grandes y pequeños, tradicionales y nuevos, como ya viene ocurriendo en los últimos años. No obstante, hay que considerar que las redes también pueden ser un componente crítico para el ecosistema, las líneas tradicionales de la industria son cada vez más borrosas, y particularmente entre los proveedores de servicios móviles y las finanzas, es posible encontrar tanto oportunidades

para nuevos modelos de negocio, como también amenazas competitivas inesperadas (Shrier, Canale & Pentland, 2016).

De esta manera, es posible comprender que el escenario en el cual se desarrolla el dinero móvil es en cierta forma delicado, y posiblemente por estas razones el pago móvil aún no sea una herramienta de pago cotidiana.

Por otra parte, los pagos móviles también presentan su proprio ecosistema, que desde luego puede ser bastante complejo, pues incluyen los anteriores participantes citados y otros 6 más, y las interconexiones pueden ser muy variadas. Las relaciones entre los participantes en el ecosistema de los pagos móviles juegan un papel fundamental para su desarrollo y funcionamiento. Ello ocurre porque es una innovación que para ser generada involucra diferentes conocimientos y requiere de un largo camino para llegar al consumidor como una solución segura y eficaz. En la figura 8 se resume el ecosistema en el que está incluido el pago móvil y los principales participantes responsables de que este método de pago sea usado de manera cotidiana.

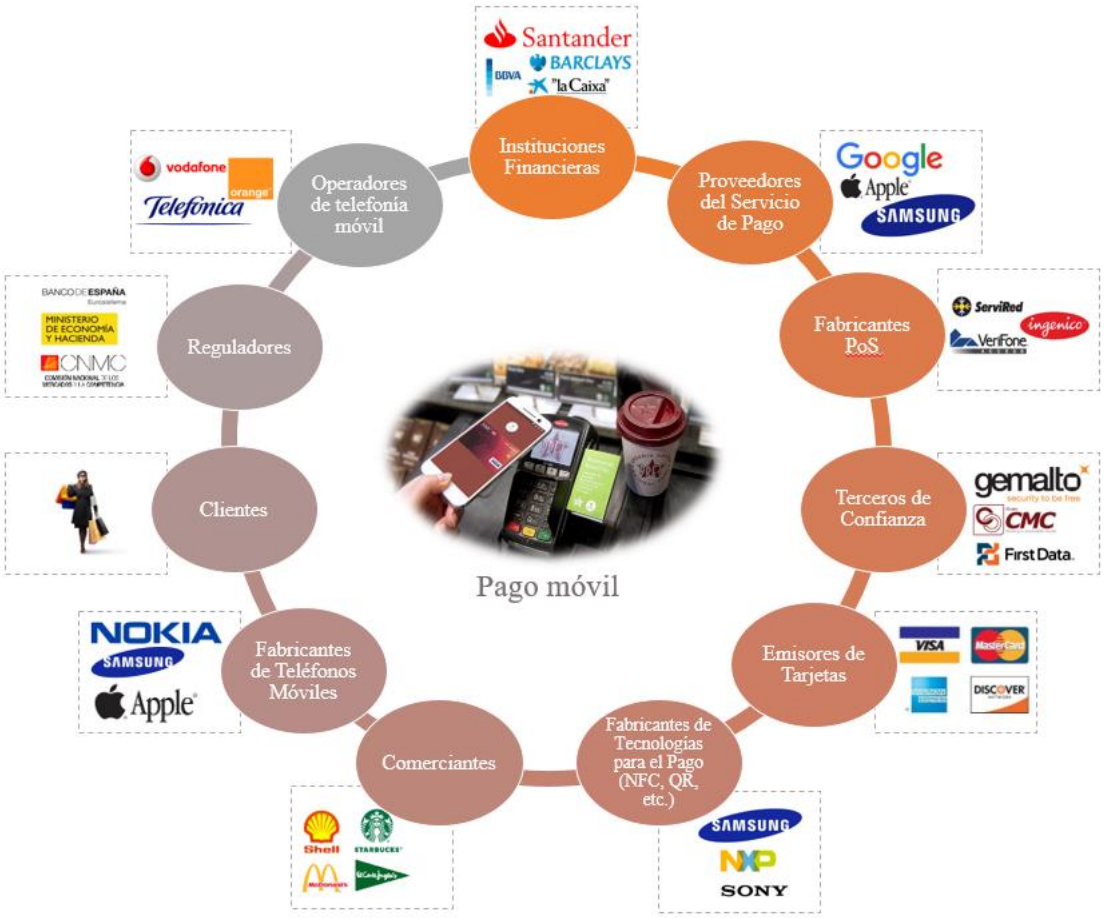


Figura 8 – Ecosistema de los pagos móviles

Fuente: Autor

A pesar de este amplio ecosistema en el que se desarrollan los pagos móviles, este medio de pago está en su infancia. El escenario actual puede parecer bastante desarrollado, pero aún puede cambiar mucho y nadie sabe cómo evolucionará a medio plazo, especialmente cuando tomamos en consideración que nuevas formas de realizar transacciones financieras, y nuevos tipos de dinero están surgiendo en el mundo. Es fácil en estos momentos imaginar un futuro en que estemos todos conectados, con transacciones sincronizadas, y prácticamente nadie usando efectivo. No obstante, encontrar la manera de llegar hasta esa realidad puede ser un gran desafío.

2.5.1 La regulación del pago móvil en Europa

Así como en otros aspectos de la actividad financiera, la regulación es un factor clave en el desarrollo de los medios de pago y puede llegar a decidir la viabilidad de los distintos modelos de

negocio en diferentes países. Hasta el momento no existe una regulación específica para los pagos móviles, pero los poderes legislativos ya empiezan a moverse en esa dirección.

Implantada en 2009, la primera Directiva de Servicios de Pago (PSD 2007/64/EC, por sus siglas en inglés *Payment Service Directive*), tiene el objetivo de crear un mercado único de pagos en la Unión Europea, y fomentar así la innovación, la competencia y la eficiencia en territorio comunitario. La PSD sigue en vigor y ha permitido solventar la dificultad y el encarecimiento de las operaciones transfronterizas existentes cuando cada estado de la Unión Europea tenía sus propias reglas, estimulando la competencia ente los proveedores de servicios.

Posteriormente, debido a los constantes avances tecnológicos se vio la necesidad de revisar la normativa anterior y el 8 de octubre de 2015 el Parlamento Europeo aprobó la propuesta de la Comisión Europea para crear pagos más seguros y más innovadores. La Directiva de Servicios de Pago, PSD2 (European Comission, 2015) concede a los países miembros de la UE un plazo de 2 años para implementar los cambios necesarios en las leyes nacionales para cumplir con las nuevas reglas.

Dicha directiva es parte de un paquete legislativo que también incluyó un reglamento de tasas multilaterales de intercambio. En conjunto, la regulación y la segunda directiva de servicios de pago serán implementadas en 2018 y supone los siguientes cambios:

- Introducción de requisitos estrictos de seguridad para el inicio y el procesamiento de los pagos electrónicos y la protección de los datos financieros de los consumidores;
- Apertura del mercado de pagos de la UE para las empresas que ofrecen servicios de pago al consumidor u orientados a los negocios basados en el acceso a la información sobre la cuenta de pago - los denominados "proveedores de servicios de iniciación pago" y "proveedores de servicios de información de cuenta";
- Mejora de los derechos de los consumidores en numerosas áreas, incluyendo la introducción de un derecho incondicional de reembolso por débitos directos en euros (“sin hacer preguntas"); y
- Prohibición de recargos si el instrumento de pago se utiliza en las tiendas o en línea.

Por su parte, el proyecto de reglamento de tasas de intercambio de las operaciones con tarjeta (las comisiones que el banco del comerciante abona al banco del comprador) establece una serie de límites máximos: 0,3% del valor de la adquisición en las transacciones con tarjeta de

crédito y 0,2% en las de débito. En este último caso, los estados miembros podrán rebajar el límite máximo, y también imponer restricciones a las comisiones en términos absolutos. Estas condiciones coinciden con las disposiciones legales que están en vigor en España desde septiembre de 2014. El objetivo de poner un tope a las tasas de intercambio es que esa limitación presione a la baja sobre la comisión que los bancos cobran al comerciante (la llamada tasa de descuento, que no está regulada por el reglamento), lo cual a su vez podría beneficiar al consumidor final. La Comisión Europea espera que la reducción de las comisiones ahorre 6.000 millones de euros anuales al sistema europeo de pagos (PwC & IE Business, 2015).

2.6 El papel del blockchain y de las criptodivisas en la evolución del pago móvil

Muchos han sido los avances tecnológicos para atender las diferentes necesidades del mercado que han sido detectadas en una gran cantidad de experimentos realizados con los pagos móviles desde 1997.

Entre estas soluciones, la más reciente es el blockchain, que promete hacer los procesos financieros más democráticos, seguros, transparentes y eficientes. Ibáñez-Jiménez (2016, p.1) explica que el blockchain "en síntesis, se basa en integrar ficheros informáticos, relacionados matricialmente por identificadores o códigos (por ejemplo, alfanuméricos), según combinaciones generadas con algoritmos, en múltiples ordenadores y de forma idéntica en todos. Lo cual, cuando un número suficiente de usuarios participa en el sistema, permite la perfecta, irreversible y sincrónica identificación del contenido incorporado a aquellos ficheros."

De acuerdo con Shrier, Canale & Pentland, (2016) el blockchain representa una innovación tecnológica que permite interacciones transparentes de las partes en una red más fiable y segura, que distribuye el acceso a los datos y tiene el potencial de cambiar no sólo el sector financiero, pero también muchos otros, incluyendo los de la salud, logística e inmobiliario. En efecto, la inversión en emprendimiento en el campo de blockchain fue de $ 1 mil millones en 2015 y se espera que crezca a $ 10 mil millones en 2016 (Torpey, 2016).

En principio la tecnología fue creada para gestionar la criptodivisa Bitcoin, pero en otros ámbitos de la actividad económica, la tecnología blockchain puede traer diversas ventajas que, a los ojos de algunos empresarios, inversores, organizaciones internacionales y gobiernos, puede revolucionar el sistema financiero mundial. En la tabla 6, se exponen los principales beneficios de

la tecnología blockchain, la cual posiblemente será plenamente integrada en los pagos móviles en el futuro.

Tabla 6 - Beneficios de la tecnología Blockchain para la industria financiera

Fuente: Autor, basado en Delloit 2016

La atención que actualmente se presta al blockchain llega a ser comparada con la que tuvo el nacimiento de internet, lo que indica que estamos ante un nuevo modelo basado en la descentralización, que posiblemente va a derribar fronteras, como hizo internet en su momento. Esto es especialmente evidente si atendemos a la gran cantidad de procesos a los que puede ser

aplicada: Pagos domésticos, pagos internacionales, contratos, registros de verificación, etc.... en definitiva, cualquier tipo de transacción es disruptible con aplicaciones basadas en blockchain.

En los últimos años la llegada del blockchain ha ofrecido a la industria mundial de servicios financieros una energía adicional para generar nuevos servicios financieros, además de que no es solo en esta área de negocio donde blockchain está ganando adeptos. A modo ilustrativo, el *Blockchain Capital* (anteriormente conocido como *Crypto Currency Partners*) consiguió recaudar, en 2015, 7 millones de dólares para su segundo fondo de inversión para proyectos relacionados con Bitcoin y blockchain, que se centran específicamente en casos de uso no financieros (Amit, 2015).

En 2015 la empresa GrowthPraxis publicó un informe en el que identificaba 20 casos de uso de la tecnología blockchain para servicios no financieros, al monitorear de cerca nuevas empresas que ya están operativas o están en modo oculto. Algunos de estos casos son: la digitalización de documentos/contractos y pruebas de propiedad para transferencia (Colu); descentralización de la gestión de registros de pacientes (Bithealth); pruebas de propiedad de contenido digital (Blockai, Bitproof, etc.); Proporcionar una identidad digital para proteger la privacidad del consumidor (Trustatom, Followmyvote, etc.), crear puntos de transferencia de valor para realizar viajes compartidos (La'Zooz); Plataformas de predicciones descentralizadas para los mercados de acciones, políticas, etc. (Augur); entre otros. En definitiva, es muy posible que veamos esa nueva tecnología integrada a nuestro cotidiano en muy poco tiempo.

De esta manera y conociendo su gran potencial tanto para los servicios financieros como para los no financieros, es importante incluir esta tecnología en el presente análisis, ya que todo indica que este será un importante paso en el proceso de comercialización y adopción de los pagos móviles.

Países como China (Long, 2016), Reino Unido (UK Governmet Office for Science, 2016), Japón (Rizzo, 2016), o incluso el Vaticano (O'Ham, 2016), están explorando versiones electrónicas de su propia criptoxicidad y legitimando las monedas digitales mediante la incorporación de su ya existente esquema regulatorio, mientras que paraísos fiscales como Barbados (Allison, 2016) están emitiendo moneda digital fiduciaria y tratando de atraer *startups* de monedas digitales.

Las corporaciones más interesadas en el blockchain son los bancos y demás instituciones financieras. Un estudio reciente del IBM Institute for Business Value (2016) entre bancos e instituciones globales demuestra que soluciones comerciales para el área financiera están siendo rápidamente adoptadas por este tipo de organizaciones. Además, el estudio demostró que 65% de

los bancos esperan tener soluciones de blockchain en producción en los próximos 3 años, mientras que el 15% de los bancos y el 14% de otros tipos de instituciones financieras entrevistadas pretenden implementarlas ya en 2017.

De hecho, el banco Santander en Reino Unido ha anunciado el desarrollo una nueva aplicación de pagos en colaboración con la *startup* Ripple, que cuenta con la tecnología y que ya está siendo utilizada por el personal de la entidad (Vázquez, 2016). Esta misma entidad estima que el uso de blockchain por los bancos puede reducir el coste de la infraestructura en hasta 20.000 millones de dólares al año (Amit, 2015).

Por otro lado, el banco Santander junto con UBS, BNY Mellon, Deutsche Bank, el operador de mercado ICAP y a la *startup* Clearmatics han utilizado la tecnología blockchain en el proyecto '*Utility Settlement Coin*' (USC) dirigido a investigar y promover el uso del dinero digital entre instituciones financieras y con los bancos centrales (El economista, 2016a).

Finalmente, la banca española ha unido fuerzas, a través de la Sociedad de Procedimientos de Pago S.L., participada por 27 entidades bancarias que operan en España, estando su consejo de administración compuesto por representantes de CaixaBank, BBVA, Banco Santander, Banco Sabadell, Bankia, Banco Popular, Kutxabank y Unicaja. De esta manera pretenden gestionar en conjunto la plataforma de pagos Bizum, un sistema que aglutinará a la gran mayoría de las entidades del país y que estandarizará las transacciones bancarias de empresas y particulares utilizando la tecnología blockchain. Se trata del primer paso para la implantación de una plataforma común con la que se puedan realizar operaciones al instante y a través de todos los canales digitales (Bronte, 2016).

En este nuevo escenario, en los próximos años se esperan grandes cambios en el sistema financiero y en la manera en que las personas realizan transacciones financieras. Para los pagos móviles eso supone un gran avance ya que con esta tecnología será posible agregar más valor para el usuario con la unificación de un sistema, y aumentando la seguridad y la comodidad de realizar las transacciones. Aunque seguramente surgirán inconvenientes en este proceso, es posible que estemos ante un camino sin vuelta atrás, ya que, incluso en el caso de que el blockchain no llegara a funcionar del todo, otra tecnología mejorada será con toda probabilidad desarrollada para que se alcancen los objetivos de descentralización del sistema.

2.7 Perspectivas para los pagos móviles

Como se comenta en los puntos anteriores, el panorama internacional de los pagos está cambiando rápidamente y aunque queda camino por recorrer para la masificación de los pagos móviles, el uso cotidiano de estas formas de pago está muy próximo.

Esta afirmación es cierta por diversas razones: En primer lugar, porque los consumidores son cada vez más exigentes y eso hace que las empresas se vean presionadas para evolucionar y mejorar sus servicios si desean atender convenientemente las necesidades de sus clientes. Por otro lado, el propio sistema de pago presenta numerosas ventajas, como la alta movilidad, facilidad de uso, naturaleza inmediata, optimización del proceso de compra y venta, mayor seguridad y comodidad, posibilidad de integración con otros servicios, etc.

Además, a través del uso de los pagos móviles, los minoristas se ponen en una posición en la que pueden utilizar los datos de pago para ayudar e informar mejor a sus clientes. Este efecto se puede amplificar mediante la vinculación de servicios relevantes como programas de fidelización, ofertas personalizadas, compras y pedidos, comparaciones de productos y más (MOBGEN, 2015).

Finalmente, los bancos y las compañías de tarjetas de crédito, que nunca antes han tenido amenazas, ahora están sujetos a la feroz competencia de una nueva generación de proveedores de servicios digitales, cuyas soluciones de banca móvil son a menudo descentralizadas, mucho más baratas, más transparentes y orientadas al cliente que los servicios que sus clientes usan actualmente.

Lo dicho hasta aquí supone que la integración de las soluciones de pago móvil agregará un gran valor para minoristas y consumidores. Al mismo tiempo, con todo el potencial que tienen los pagos móviles para la industria, su buen funcionamiento implica para los participantes de su ecosistema una fórmula de éxito, mostrándose de esta forma como el futuro de los medios de pagos en el mundo.

Con un valor de transacción global en torno a los 2.221 millones de dólares en 2016, el segmento de pagos digitales representó con mucha diferencia la mayor participación en el mercado total de FinTech, afirma Bohnhoff (2017). Cuando hablamos de pagos digitales estos incluyen los realizados en el comercio digital, los pagos móviles en el punto de venta y las transferencias entre dos personas a través de cualquier dispositivo móvil (P2P).

Globalmente se espera que la industria de Pagos Digitales duplique su valor de transacción en 2021 y alcance los 4.644 millones de dólares, teniendo en cuenta que se espera que los pagos

móviles crezcan más de 8 veces entre 2016 y 2021, a una tasa de crecimiento anual compuesta del 52% (Bohnhoff, 2017). Esto explica que la mayoría de los proveedores de servicios se hayan involucrado en este nuevo mercado.

Específicamente en Europa, el progreso de los pagos digitales va un poco más lento que en otros continentes como América y Asia, pero aun así demuestra que el escenario está en movimiento y es de esperar muchos progresos en este ámbito de los pagos móviles en los próximos años (véase gráfico 4).

Se espera que el futuro traerá cambios en el comercio digital comenzando por el desarrollo de las carteras digitales como PayPal, Apple Pay o la antigua Google Wallet. Además, con la tan esperada revolución FinTech que propone innovaciones en soluciones de pagos más descentralizadas y abiertas a todo el mundo, es muy posible que con el tiempo los pagos con tarjetas de crédito se vuelvan menos lucrativos para las redes de tarjetas, los bancos emisores y comercios adheridos.

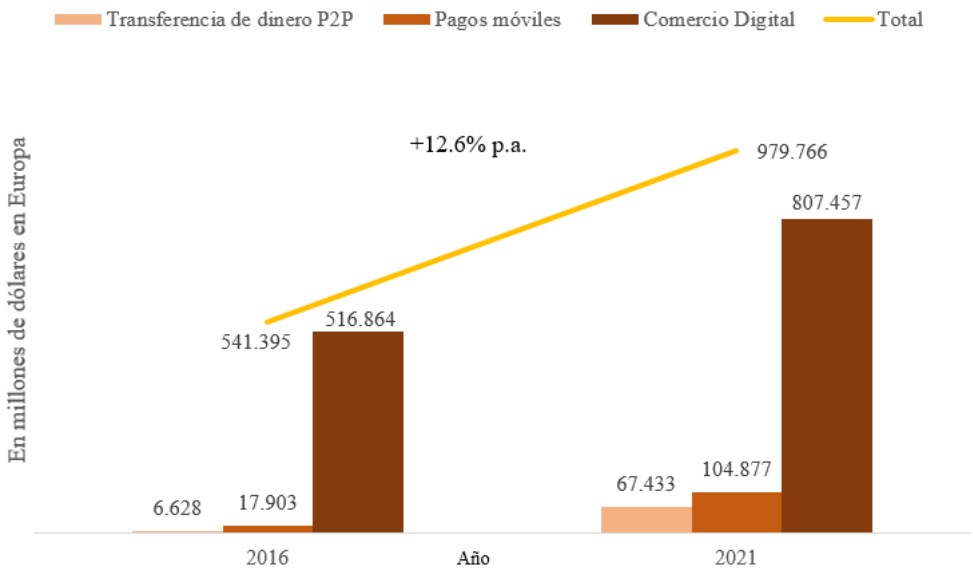


Gráfico 4 - Pronóstico del valor de transacciones de pagos digitales en Europa

Fuente: Datos de Bohnhoff (2017)

Por otro lado, es de esperar un inmediato proceso de convergencia y de estandarización en el ecosistema de los medios de pagos. El cómo y el cuándo dependerá de las necesidades y las

expectativas de los clientes, así como de la capacidad de las empresas del sector para generar soluciones comunes. En ese proceso de unión de ambos intereses influyen una serie de tendencias, de carácter global, sectorial y tecnológico, de cuya confluencia dependerá cómo se desarrolle el escenario de los medios de pago en el mundo (PwC & IE Business, 2015).

Las tendencias globales que más impacto van a tener en los próximos años en el sistema de medios de pago son características de la sociedad contemporánea y son transversales a todos los sectores e industrias. En casi todas ellas el elemento catalizador es Internet y la tecnología digital, y la consecuencia principal es el aumento del poder de decisión e influencia del consumidor. De acuerdo con PwC algunas de las tendencias que van a potenciar en mayor medida los pagos móviles en los próximos años son:

- La movilidad: La gran y creciente adopción de dispositivos móviles en el mundo trae como consecuencia cambios radicales en las formas de comprar de los ciudadanos, y también en el surgimiento de nuevos modelos de negocios. La aplicación de la geolocalización da el beneficio de conocer dónde está el cliente en cada momento, y abre las puertas a nuevas maneras de atraer el cliente a través de campañas de marketing más innovadoras.

- Redes sociales: Los usuarios están cambiando, y las nuevas generaciones de "nativos digitales" tienen más recursos para reconocer rápidamente las ventajas (y las desventajas) de cualquier nueva tecnología, incluyendo las de los sistemas de pago (Goodrich & De Mooji, 2014). Por ello, el usuario tiene cada vez más poder y se convierte en prescriptor de los productos que utiliza o recomienda, pudiendo llegar incluso a generar contenido viral. El uso de las redes sociales no para de crecer, y no sólo por el entretenimiento que ofrece, sino también por ofrecer contenido que sirve como referencia para la toma de decisiones de muchos usuarios en su comportamiento cotidiano. En 2015 el número de usuarios globales de redes sociales era de 2.14 mil millones y se espera que alcance los 2.95 mil millones en 2020, lo que es casi un tercio de la población global (Statista, 2016). Además, las redes sociales tienen un gran potencial para convertirse en un canal de pago, especialmente de particular a particular. Facebook (que en marzo de 2015 tenía más de mil cuatrocientos millones de usuarios activos) anunció recientemente que permitirá el envío de dinero a través de su aplicación de mensajería Messenger. Se han realizado estudios sobre este particular, habiéndose encontrado pruebas de que las redes sociales afectan

significativamente el proceso de decisión de compra online y offline (Goodrich & De Mooji, 2014), al proceso de adopción de las nuevas tecnologías (Risselada, Verhoef, & Bijmolt, 2014) y en concreto, a la adopción de los pagos móviles (Koenig-Lewis, Marquet, Palmer, & Zhao, 2015).

- Big Data: Posibilita la transformación de datos en patrones de comportamiento de los clientes para obtener una ventaja competitiva y es también una herramienta útil para la detección temprana del fraude. El Big Data se nutre de la gran cantidad de información que se genera en los medios sociales y de transmisión electrónica. Se espera que los ingresos procedentes de las ventas de grandes volúmenes de datos y aplicaciones de análisis de negocio, herramientas y servicios, aumentará más de un 50% en cuatro años, pasando de casi 122 mil millones de dólares en 2015 a más de 187 mil millones de dólares en 2019 (International Data Corporation, 2016).

- Cloud Computing: La nube es más barata que la arquitectura tecnológica tradicional y aporta una gran flexibilidad en el uso de la información. Hasta su aparición, cualquier empresa estaba obligada a crear una infraestructura tecnológica compleja y rígida de difícil adaptación a sus necesidades reales. La nube, en cambio, se adecúa a cualquier demanda. Según las estimaciones de Gartner, el cambio hacia la nube afectará en más de 1 mil millones de dólares en el gasto de TI en 2020 (Cardenal, 2016). Un ejemplo del potencial del *cloud computing* es Salesforce.com, que es uno de los principales impulsores de la revolución de la computación en la nube y uno de sus mayores beneficiarios. La empresa es un pionero de la industria de la computación y ha construido una cartera diversificada de servicios en torno a los CRM. Salesforce ha tenido un crecimiento de ingresos impresionante en los últimos años en que los ingresos totales en el segundo trimestre de 2016 fueron de 2,04 mil millones de dólares, y presentando un crecimiento de 25% respecto al año anterior. En términos de moneda constante, los ingresos de Salesforce.com se incrementaron en un 26% (Cardenal, 2016).

- Wearables: Son tecnologías que están en una fase más temprana de implantación, en especial los relojes inteligentes, y que presumiblemente cobrarán un gran impulso en los próximos años. Por otro lado, como ya se ha comentado en el punto 2.4, es un mercado en

constante desarrollo y que aún puede sorprender mucho, especialmente en el ámbito de los pagos.

- IoT: La internet de las cosas es una de las grandes revoluciones en marcha. Cada vez más dispositivos de diversa naturaleza están conectados a Internet y proporcionan información en tiempo real, o realizan de forma autónoma determinado tipo de acciones. El ejemplo típico es la nevera que detecta que falta algún alimento básico y hace la compra en el supermercado. También se puede utilizar para facilitar la experiencia de pago en las tiendas, identificando los productos que se lleva el cliente y cobrándole de forma automática a su salida. Aunque a veces no nos demos cuenta de la proliferación de este tipo de dispositivos, su progresión es asombrosa. Según estimaciones de Cisco, en 2014 ya había en el mercado 14.000 millones de aparatos conectados, y en 2020 se superarán los 50.000 millones.

- Blockchain: Esta tecnología promete revolucionar las transacciones de pago en todo el mundo. El año de 2016 la industria y el ecosistema blockchain ha pasado por grandes transformaciones, tanto positivas como negativas para las criptomonedas y sus respectivas cadenas de bloques de muy distintas utilidades. Para ilustrar la importancia de esta tendencia en el desarrollo del mercado de los pagos móviles, en la tabla 7 se presenta las empresas que más se destacaron en 2016 por su gran crecimiento en valor de mercado.

Tabla 7 - Empresas blockchain que más se destacaron en 2016 (valores en dólares)

Empresa	Precio en Enero de 2016	Precio en Diciembre de 2016
Bitcoin	$432,28	$982,44
Ethereum	ETH= $0,84	ETH= $7,6; ETC= $1,12
Ripple	$0,0059	$0,0062
Monero	$0,47	$13,6
Dash	$3,29	$10,2
Sttemit	Steem= $1,03, SBD= $1,45	Steem= $0,15; SBD= $0,99
Zcash	$2,3	$49
Counterparty	$0,56	$1,63

Fuente: Pérez (2016)

En consonancia con lo anterior, podemos esperar que las características de pago se vayan integrando paulatinamente en todo tipo de objetos cotidianos. De los coches a los televisores inteligentes - casi todos los objetos personales podrán participar en las transacciones de pago. Esto permitirá a los clientes pagar incluso más rápido y más fácilmente. Un contacto físico no es estrictamente necesario cuando el dinero se intercambia digitalmente. Los tiempos de espera se reducirán a un mínimo o se eliminarán completamente. Al salir de un aparcamiento, la duración de la estancia se registrará automáticamente y el pago se hará al acercar el móvil a un lector/pantalla para confirmar la cantidad pagada, pudiendo esto ser realizado directamente desde la pantalla digital insertada en el salpicadero del coche.

La protección de los datos y la privacidad, especialmente en el sector financiero, deben mostrar grandes avances en los próximos años. La gran apuesta actualmente está en los métodos biométricos que deberán sustituir los sistemas convencionales de autenticación como PIN, contraseñas y tarjetas para garantizar un mayor nivel de seguridad. La aplicación de métodos más personales, incluyendo reconocimiento de huellas digitales, faciales e iris son los más conocidos, pero ya se habla de métodos más sofisticados de autenticación que utilizan características físicas altamente individuales como latido cardiaco, estructura de la vena y ecos del cráneo, que

proporcionan cada vez más seguridad y que son más resistentes a los ataques de hackers y otros tipos de cibercriminales (Pritchard, 2015).

Respecto a la pregunta de si es el pago móvil realmente el método de pago del futuro, debemos responder que no. El pago móvil es el método de pago del presente. Los trabajos e investigaciones que se llevan a cabo buscan perfeccionar los procedimientos y adaptarse a los cambios constantes de los consumidores, sus necesidades, y las innovaciones tecnológicas. El pago móvil es un medio de pago que ya existe y que funciona en muchos países. Aunque su uso aún no sea comparable al efectivo, el potencial para expandirse es muy grande y, con toda seguridad estará cada vez más presente en la vida cotidiana de los consumidores.

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CHAPTER 2

MOBILE PAYMENTS:

PAST, PRESENT AND FUTURE

This chapter contextualizes the concepts and technologies most common in the framework of mobile payments. In addition, it describes the current situation of mobile payment systems as well as the ecosystem in which these types of tools developed. Moreover, it specifically discusses the relevance of Blockchain with regards to payment systems, and more concretely its great potential to bear an influence on the future dynamics of the means of digital payments that include mobile payments. Finally, this chapter exposes the tendencies with major potential future influence as well as the main perspectives of mobile payments.

2.1 The origin of mobile payments

To describe the emergence of mobile payment systems it is necessary to take a brief tour of the history of means of payment that is closely related to the progress of economic activity. Hence, advances in payment systems have historically favored economic development while, by contrast, a developed and modernized market demands a growth and modernization of payment systems. Summarized in Figure 3 are the main milestones in the evolution throughout history of the means of payment from the scheme of PwC & IE Business (2015).

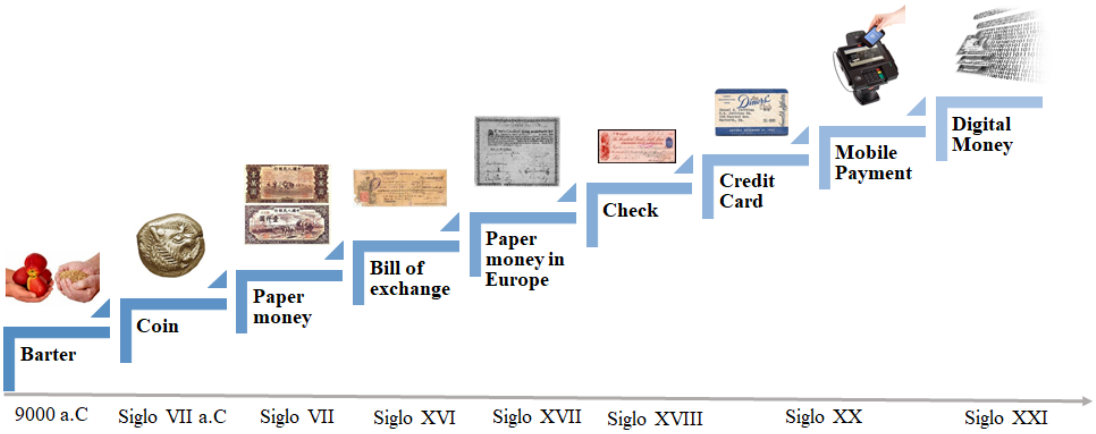


Figure 3 – The evolution of means of pyment throughout history

Source: Author, from Romero & Ramos (1973), Kaynak et al, (1995), Dahlberg, et al. (2015), PwC & IE Business (2015), Bitcoin.org (2017).

Barter is the oldest known payment method which gave way to trade in goods and laid the foundations for an incipient economic system. Barter has important drawbacks in particular that in order that the transaction take place, each of the parties had to desire what the other offered. In the first millennia of agricultural cultures, the most valuable commodities were salt, seeds, and shells. Subsequently, in the 7th century BC, coins began to be used. This rendered carrying out exchanges without bartering, and therefore with a sole bidder and client of a particular good or service. Coins were initially a mixture of gold and silver and began to be used in Lydia, a kingdom in today's Turkey, with King Croesus, renowned for his immense wealth.

Notes or paper money appeared for the first time in the 7th century AD in China in response to the growing demand of coins caused by economic growth that made transport of money increasingly dangerous and expensive. Hence merchants began to revert to blank payment orders they could be collected in another city. As these documents became popular, they began to be printed as notes that later were issued on the emperor's own account, as noted in Marco Polo's 13th-century chronicles. It took several centuries for notes to reach Europe. The first western bank to issue state backed notes was the Swedish Riskbank in 1661.

Shortly afterwards, the 17th century saw the generalization in Europe of the promissory note, a document serving both as a means of payment and a tool of credit. Its negotiable character, recognized since the 16th century in Italy, and admitted little by little in other countries, was fundamental to mobilize the financial resources at the international level and to pay for the commercial revolution of the Renaissance and later centuries.

Another great breakthrough was the check, which completely changed the conception of the means of payment. Although its origin is not exactly known, there is evidence pointing to England in 1780 (Romero & Ramos, 1973). This means of payment introduces the element of trust in the transaction as checks have no intrinsic value (such as coins of precious metals). They do represent a document y which merchants assume reception of the stipulated sum since a Banking institution participates as an intermediary to reimburse the merchant on behalf of the client.

After the check, the next technological and conceptual leap in the history of the means of payment was the appearance of the credit card. The first were issued in 1914 in the United States by Western Union. Later, there were other attempts, but the definitive recognition of plastic money came in 1950, when Diners Club launched a card that served for payments in stores and restaurants. Legend has it that the idea came when their founders were having dinner in a New York restaurant and realized they were not carrying money. True or false, it is certain is that this was the seed of the great consumption revolution in the United States in the 1950s and 1960s. The American Diner Club was followed by the very popular American Express launched in 1958 by Bank of America. During the 1960s and 1970s, Visa and MasterCard expanded their operations on a global scale (Kaynak, Kucukemiroglu & Ozmen, 1995).

Major changes took place in a short period of time during the 1990s. The emergence of the Internet and the development of electronic commerce represents a radical advance in payment

habits allowing, for the first time, to carry out operations of all types from the living room of a house.

Credit cards, cash or cash on delivery, and direct debits and transfers have served to make payments in electronic commerce from its inception to present times (Rodríguez-Martínez, 2015). Yet the task of maintaining the security of electronic transactions is a constant challenge as new attacks are constantly taking place. As a result of the insecurity, traditional forms of payment were improved for electronic use while giving way to new ways of paying online. Consumers in this manner have the option to use both online payment methods as well as mixed payments that can be carried out online and/or at the point of sale.

In 1998, Confinity saw the emergence of a financial platform designed to transfer money via PDAs *(personal digital assistant)* and was quickly oriented toward e-commerce payments. Three years later the company was renamed PayPal, its current name. Its success has been overwhelming, especially in the early 2000s. In 2002 eBay bought PayPal for $ 1.500 million, at a time when the system already represented 50% of the payments of the portal. At that time PayPal was the payment method serving more than 100 thousand users (Inversia, 2016).

Currently, PayPal allows users make payments without charge over the Internet from a computer or from a mobile phone. It has become one of the major networks of global payments for auction websites and increasingly serves for the sale of goods, services, travel, digital content, as well as other professionals operating outside the Internet, including lawyers, contractors and doctors. These professional have also begun to receive more and more payments on the Internet through PayPal[2]. The company currently counts about 152 million active accounts and is present in more than 203 markets worldwide. With the advent of mobile technology, it has boosted its service reaching a level of transactions beyond $27.000 million (Inversian, 2016). In fact, in 2016, PayPal was the most used means of payment by Spanish Internet users for online purchases (72%) (Statista, 2017).

Since the inception of PayPal in 1998 and the start of micropatronage or *crowdfunding* at about the same time, there has been an explosion of creativity and entrepreneurship in the technology sector related to finance (BBVA Innovation Center, 2015). Companies outside to the traditional financial sector, began to use technology to propose innovative solutions that not only offer services traditionally associated with financial institutions, but also seek to improve them

[2] https://www.paypal.com/es/webapps/mpp/about

from a perspective focused on user experience. According to the BBVA Innovation Center (2015) some of these solutions and companies are:

- Payment gateways: Authorize.net, Amazon Payments, Safety Pay, Dwolla, Braintree, Sofort, Facilpay, Trustly, Aplazame; Apple, Google, PayPal, Amazon and Alibaba already offer payment solutions that replace wallets and credit cards.
- Loans - Zopa, Lending Club, and Funding Circle, examples of platforms peer-to-peer that connect lenders and borrowers.
- Investments - Robo-advisors as WealthFront, Futureadvisor or SigFig that use algorithms to dispense counseling and management of online personal financial investments.

Even if the notion is held that mobile payments are a new payment solution, this is not exactly the case in the technology market. Efforts to start a means paying with a mobile as a tool also began in this period. This began specifically in 1997 in Finland with Coca Cola experimenting for the first time in the world a mobile payment system allowing the purchase of soft drinks in a vending machine processing the sale by means of SMS (Dahlberg, Guo & Ondrus, 2015).

Mobile payment services in the 2000s became a trend in the business world even after the advent of the Internet and its great success (Dahlberg, Mallat, Ondrus & Zmijewska, 2008). Hundreds of mobile payment services were introduced around the world, especially in the form of experiments. These included electronic payments and access to Internet banking. Surprisingly, many of these efforts failed, and few have survived the passage weather.

Among the different solutions that has emerged during this period was Google Wallet, one of the first companies to mention the term "virtual wallet" for payment online or in physical store using the mobile. Launched in 2011 and still active today, especially in the United States, it stands out because it allows the consumer to pay with the mobile by simply approaching the device to the store's sales terminal.

As can noted in some of the antecedents of the current means of payment, new technique such as mobile payments are not only the result of the constant progress of information, communication and economic technologies, but also stem from certain problems associated with the management of cash. These include: (1) the need to lower the cost of money and existing means of payment; (2) to give flexibility to small purchases and existing means of payments; (3) increase protection and security against fraud and other forms of crime; and (4) increase the pressure of the

financial sector by new regulations that oblige them to seek more profitable ways of managing their business (Tamayo, 1999; BBVA Innovation Center, 2015).

As smartphones have an increasing presence in the lives of consumers, and the technological innovations of these devices do not cease, efforts in the last two decades continuously attempt to generate effective and secure mobile payments

Technology and financial companies have therefore invested in the development of technologies to transmit payment data securely from the mobile payment device to the commercial point of sale (POS). Some forms of mobile communication to POS that have emerged include *Magnetic Secure Transmission* (MST), *Near Field Communication* (NFC), *Quick Recognition* (QR) Code, Bluetooth, Bluetooth Low Energy (BLE) and short message service (SMS) (ENISA, 2016).

During the last decade, new methods of payment have been launched to optimize the online or physical payment process. According to Rodríguez-Martínez (2015) these innovations include: virtual cards, also called "single use credit cards," designed to perform a single online transaction without issuing a physical card (BBVA, 2015);

- The contactless cards, which allow payment by approaching the card to the POS terminal of a business using NFC technology;
- Store payment applications owned by certain businesses with the aim to streamline the process of booking or purchase to increase efficiency in running their businesses.
- Mobile payments which have gained new and important technological participants in the market development mobile payments such as, for example, Samsung with the Samsung Pay, and Apple with Apple Pay.

The last major milestone in the evolution of means of payment occurred in 2008 with the creation of the Bitcoin digital currency, the first use of a concept known as "crypto-currency" (Nakamoto, 2008). This was first described in 1998 by Wei Dai on the e-mail list "cypherpunks" proposing the idea of a new type of money that would use cryptography to control its creation and transactions, instead of a centralized authority (Bitcoin.org, 2017). The first specification of the Bitcoin protocol and the proof of concept was published by Satoshi Nakamoto in 2008 in an article in *Cryptography Mailing List* (metzdowd.com). In late 2010 Satoshi left the project without revealing much about himself (Bitcoin.org, 2017). Since then, the community has grown exponentially and has numerous developers working on the Bitcoin protocol. The Bitcoin protocol and its software are

published openly and any programmer anywhere in the world can review it or develop their own modified version of the software. But this is no longer history. It is the present and future of means of payment.

2.2 Classification of mobile payments

The current mobile payment solutions are based on the technological development of smartphones that allow development of payment applications that can be used in various ways during payment transactions. Surprisingly, there is a lot of misinformation about what mobile payments generating confusion when it comes to differentiating them. Wester (2011) classifies mobile payment systems into 5 main categories (Figure 4).

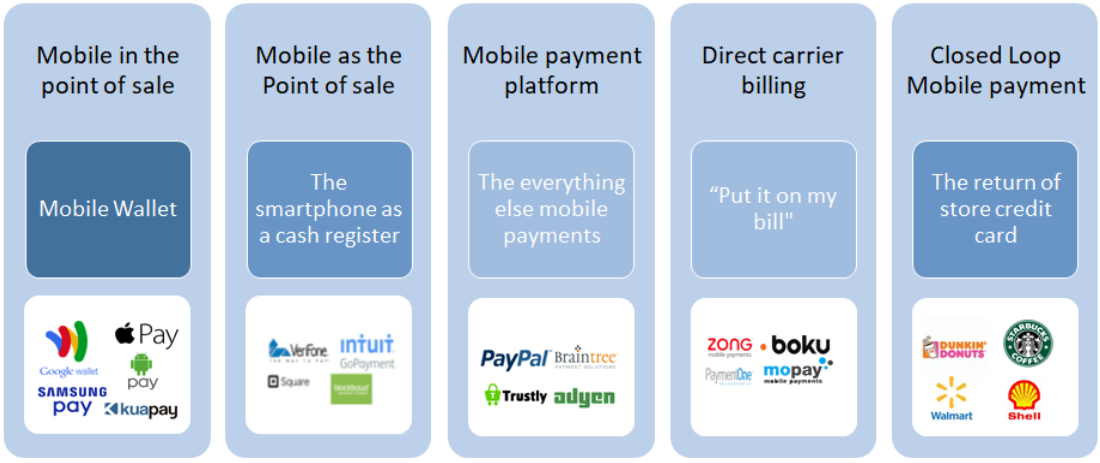


Figure 4 - Categories of mobile payments

Source: Author, from Wester (2011)

The mobile payments at the point of sale is known as mobile wallets, the purest type of mobile payment. The form takes place when a mobile phone carries out a payment at a point of sale when acquiring a product or service. This type of payment can revert to various technologies such as NFC, QR codes or other similar *"tap and go"* technology. In addition, these methods do not necessarily include only payment actions as they can carry out other functions and services.

A mobile as a point of sale is also considered a type of mobile payment when the smartphone functions as a cash register. In this case merchants use a mobile device to process

payments that customers make with credit cards, a method that should not be confused with mobile wallets.

Mobile payment platforms include all other types of payments using mobile device. In other words, it is any method that allows consumers to send money to traders, or even to each other (sometimes called P2P).

A purchase with direct billing of the mobile operator adds the price of the product or service to the monthly telephone bill. Usually it serves to purchase digital content such as games, apps, etc. This type of payment is growing in recent years.

Finally, *closed loop* payments are mobile applications developed specifically for a store or brand that works not only as a payment option at this store, but also includes additional services related to payment, such as notice of promotions, loyalty programs, discount coupons, etc. This technology is considered a new channel of relationship with the customer using a mobile platform that integrates both the payment at the point of sale and other mobile marketing services. An example of this service launched by Starbucks saw 3 million transactions in its first two months. The main characteristic of this payment category that differentiate it from others is that a consumer can only use it in a particular store and not in several, as is the case of the previous examples.

For the needs of this study, we focused on mobile payment at the point of sale through a mobile application that functions like virtual wallet. This decision is based on the fact that (1) the major players in the race for mobile payment, including both the leading technology companies and large number of technology *startups,* are devoting all their efforts on providing a mobile wallet application comprising all the other existing types (credit cards, bank transfers between consumers and/or businesses, store cards, loyalty programs, etc.). Among the companies are Google wallet, Apple pay, or Samsung Pay; (2) adoption of this type of payment implies a significant change in the life of the consumer and in his decisions on purchasing products and services; and (3) this means of payment provides information of fundamental importance to optimize the business-customer relationship and will significantly change the way companies promote their brand, products and/or service.

Thus, for the purposes of this study, mobile payment is defined in the following manner (Pousttchi, 2008; Liébana-Cabanillas, Muñoz-Leiva & Sánchez-Fernández, 2015):

It is a type of financial process of a private or business nature, in which an electronic mobile communication device is used to initiate, authorize and carry out a financial transaction.

2.3 Technologies for carrying out mobile payment

There are a number of different technologies that carry out mobile payment as defined in the terms introduced in the previous section. Many technologies have developed that share as a common denominator the desire to generate safe financial operations. Among these technologies are: Near Field Communication (NFC); QR Codes and Bar Codes; Bluetooth; Biometric; Radio Frequency Identification (RFID); Sound waves and ultrasound; Dynamic magnetic stripe; SMS / USSD, Mobile Internet or *Magstripe Emulation.*

This study focuses on three technologies with the greatest presence in the market in the last 5 years: NFC, SMS and QR Codes. Below is a brief description of each.

2.3.1 NFC as a payment system

Near Field Communication (NFC) is a short-range wireless technology that enables the exchange of data between different devices at a rate of 13.56 MHz. The exchange of data may can be carried out for different purposes, including payment. This technology includes multiple communication standards for contactless IC cards and is based on the international standard ISO/IEC 18092 (NFCIP-1). It is also defined by the specifications developed by the NFC Forum, a non-profit association founded by Nokia and Sony Corporations. The specifications are intended to ensure interoperability between NFC and other devices and non-contact cards (Sony, 2017).

This technology is attracting a lot of attention, especially since it is an easy-to-use method for data exchange that requires simply to approximate the devices. In addition, the functions of NFC technology are unlimited as it can be integrated in many features.

This technology, when integrated in a mobile, can allow, in addition to payment functions, the incorporation of loyalty services, ticketing, identification, time saving in queues, physical access to events or private buildings, secure access to other devices, exchange Information on

devices, point-of-sale advertising, promotions, use in public transport, event tickets, personalized sensor programming, map downloads, brochures, tickets, catalogs, etc. (see Figure 5).

Figure 5 - Applicability of NFC technology

Source: author

In addition to its varied applicability, NFC technology has other advantages, as well as drawbacks (Table 2).

Table 2 - Advantages and disadvantages of NFC technology

Advantages	**Disadvantages**
It is a robust system	It has a short range of connection
The convenience of access to the technology in a mobile that can be activated at will	Its storage capacity is very limited

The connection time between the two devices is extremely fast (0.1 seconds) and is automatic	Implementing the NFC system is costly
Enjoys international standards	Hardware and software programming is complex
Applies security protocols for data transmissions	At 424kbits/s it is slower than Bluetooth (1-3 Mbit/s)
Offers a greater energy efficiency and can be used only when necessary	The penetration of next – generation smartphones wht NFC chips is still very low in some countries
Source: Author	

Operation with NFC devices depends on the amount of the payment. For values below 20€, the salesperson enters the amount of the transaction in the POS. Then the client nears the card to the POS and the result of the operation appears on the screen and a copy for the store is automatically printed. The operation is the same for purchases over 20€. Yet in this case the customer must enter his PIN in the POS to validate the operation. Meanwhile, it is possible to change the system of the PIN request, so that instead of requiring the PIN in the case of purchases over 20€, it is asked for any amount.

NFC technology is currently widespread in the case of credit cards, especially in Spain. According to Visa Europe (2016), this type of technology does not stop growing. In a period of 12 months (April 2015 to April 2016) Visa Europe carried out 3 billion *Contactless* transactions, almost tripling the figure for the same period last year. Europeans in the month of April 2016 alone used their *contactless* cards 360 million times. This translates into about 140 transactions per second with an increase of 150% since April last year (Visa Europe, 2016). Moreover, it is possible that the *contactless* card be a means to familiarize consumers with NFC technology so as to accelerate adoption due to prior knowledge of the tool.

Despite its advantages, NFC in recent years has faced security problems especially in open wireless communication environments (Su, Xu & Qi, 2016; Fan et al., 2016). Devices are vulnerable at the moment of the exchange of information to any external attack against the security of the transaction, which could provoke unauthorized filtering of personal information and loss of

privacy. However, there are multiple proposals for solving these problems and a number of teams are dedicated to developing effective ways to prioritize user security (Fan et al., 2016, Park & Lee, 2016). NFC is hence still under development as mobile payment medium.

Energy efficiency, an evolving security and a wide applicability in the real world are three of the most important advantages that the NFC has over other wireless communications technologies which will undoubtedly be behind the creation of new standards in wireless communication and place this technology as one of the most promising among the mobile payment applications market in the future.

2.3.2 The QR Codes as a payment system

The so-called QR codes *(Quick Response)* are bi-dimensional symbols developed by Denso Wave interpreted easily by scanners, solid against errors and able to encrypt all kinds of information in different languages (Denso Wave, 2000). The information is encoded within a square of different size, allowing storage of a large amount of alphanumeric data that can be interpreted from any angle. Additionally, QR codes are resistant to errors, easy to generate and serve many applications (Codes-qr.com, 2016).

The QR codes technology is available publicly since Denso Wave patented it. Anyone can create and share a QR code. That is why generating these codes is easy by a great variety of programs that allow adding a number of types of information, an element that being static, links with information that is both static and dynamic.

Although originally designed for use in the automotive industry, all types of companies are using QR codes specifically as an additional tool in advertising campaigns. Table 3 shows some of the advantages and disadvantages of QR codes.

Table 3 - Advantages and disadvantages of QR codes

Advantages
It is an on profitable and easy solution to implement for mobile proximity payments in shops
It generates user information and data for the business for use in marketing strategies
It is a fairly inexpensive technology

Can be used in any phone with camera
Immediate capacity to upgrade of the information
Compatibility with different operating systems (Android, iOS, Windows)
Disadvantages
Limited amount of information that can be integrated into a code
An application must be downloaded on the phone
Many stages must be passed to complete an operation
Poor lighting, reflective surfaces and screen damage can render the code unreadable
Security can be endangered by simply reading a malicious QR code that cannot be identified until after scanning
Source: Author, Villena (2013), Singh (2016) and nearfieldcommunication.org (2017)

The main advantage of QR codes compared to other proximity technologies is its affordability and availability. Moreover, in addition to being simple, it is inexpensive to generate a code rendering it a cost-effective way of implementing mobile payment solutions and other related services (promotions, information, discounts, etc.) at the point of sale.

Among its main limitations is the payment process itself since even if they are called "quick response codes," the fact is that their scanning takes a certain time. The simplest QR payment procedure is the following: 1) the client takes out his phone and opens the payment application, 2) then chooses to pay by means of a QR code and automatically opens the phone's camera (which can take a few seconds depending on the device), 3) then points the camera at the code and scans it without shaking, 4) the types a purchase confirmation PIN, and 5) then waits for payment confirmation. This whole process is tedious, especially when considering other traditional payment alternatives (card or cash).

Regarding security, and since QR codes are only mechanically read, a malicious QR code considered completely normal to the human eye. Moreover, it is as easy to design a normal code as a malicious code. So, depending on the payment process, the customer can unknowingly scan a manipulated code. This has led, for example, the People's Bank of China to ban QR code payments in 2014 alleging security concerns and lack of regulation in the industry. New regulations that standardize security among different payment products with QR code in the Chinese market are in the works (Singh, 2016).

NFC applicability is quite varied. Advertising campaigns in the textile sector such as *outdoors* of Calvin Klein with a QR code that directs the customer to a new ad; Mobile communications such as those included in Durex condom boxes that lead the client to download an application that simulates the experience of having a baby to encourage condom use; advertising signaling codes that arouse curiosity to inform clients products of the launching of products by brands such as Volkswagen, H&M, Mango; product traceability and loyalty program launched by Danone that not only offer clients nutritional and production information, but offers collecting points for each scanned code that can later be exchanged for products from a catalog.

Many sectors have implemented the solution of mobile payments. Barclays (Barclays Pingit QR code), for example, has developed a system that allows customers to enter a QR code in their invoices to facilitate payments; MasterCard offers a new simple and streamlined payment. In the restaurant business, Starbucks (Figure 6), McDonalds, Burger King, KFC, Telepizza and Taco Bell, among others, offer a payment system based on QR, in some of its stores, thus improving their service at the point of sale. Carrefour in the retail sector began using QR codes to join the Apple Pay payment service.

In recent years, the use of these codes has increased. A study by ScanLife (2016) in several countries reveals that during the third quarter of 2015 about 23 million codes were scanned giving mobile users instant access to product information, savings, video entertainment, mobile applications and much more. This is a rather significant increase compared to the figure of 21.8 million scans during the first quarter of 2014.

However, although creative ways to use QR codes were developed to enhance customer engagement with brands in Europe, particularly in Spain, the introduction of this technology is in a less evolved stage (Sanz-Valero, Álvarez Sabucedo, Wanden-Berghe, & Santos Gago, 2016) and still face the problem of lack of knowledge on the part of consumers, in particular those that are little inclined to technologies (Singh, 2016).

Nevertheless, QR codes have great potential in Spain since 1) 80% of the population has a mobile phone enabled to use this technology; 2) in 2018 it is expected that the number of mobile users reach 5.59 thousand million of which will be 2.73 thousand million are smartphone users; and 3) tablets, which are also mostly equipped to scan these codes, will also continue their growth in 2017 hoping exceed sales of 1 billion units (Ditendria, 2016).

Furthermore, QR codes have the approval of businesses and other service providers (restaurants, hotels, etc.) due to the ease of code generating and low implementation costs for small and medium businesses. These reasons explain that this technology remains on the market and continues developing and offering clients a more satisfying payment experience.

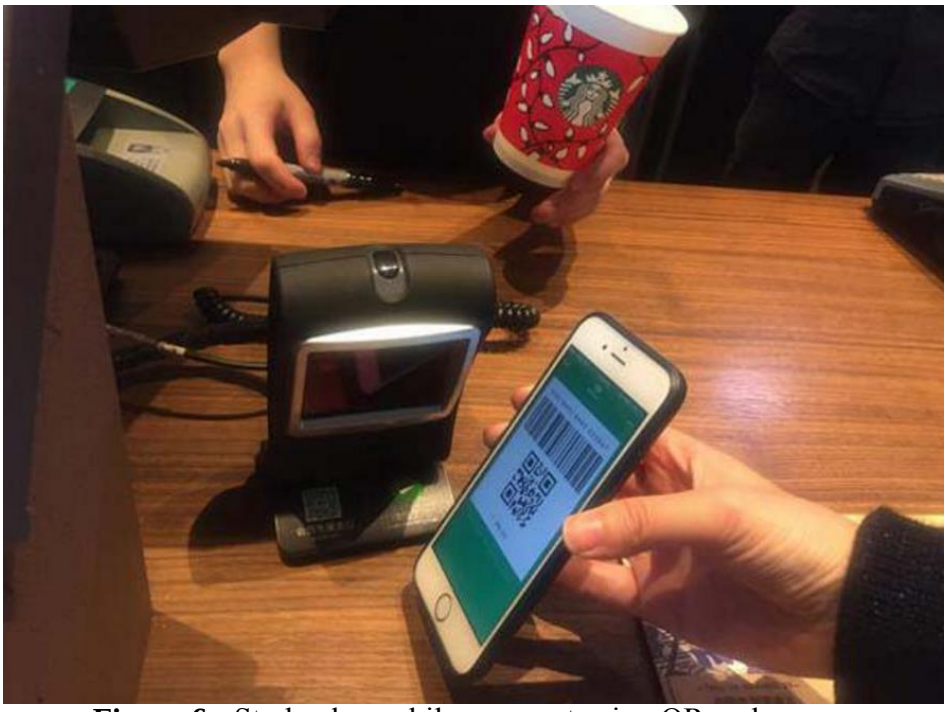


Figure 6 - Starbucks mobile payment using QR codes.

Source: China Internet Watch (CIW, 2016)

2.3.3 The SMS as a mobile payment system

Short Message Service (SMS) or short messaging service is the name given to the service of sending messages up to 160 characters between mobile telephones (Okazaki & Taylor, 2008). Although today we have many tools to communicate, short messaging mobile networks has a number of benefits that allow keep it as one of the communication options. Table 4 describes the main advantages and disadvantages:

Table 4 - Advantages and Disadvantages of SMS

Advantages

It is fast and easy to use.
You do not need internet access, it works with GSM / CDMA suppliers
All mobile telephones are compatible with this service
It's a good method to carry out micropayments
They can be used globally
No personal data or account details are released
Disadvantages
Unreliability: the higher SMS payment transactions can easily fail as messages are lost
Slow speed: the messages can be slow and may take hours for a payment to arrive at business
Security: Encryption SMS / USSD ends at the radio interface, so the message is a plain text
High cost: The hight cost of setting up short codes, paying for delivery of medias, and offering a means of customer support to account for the large number of messages that are lost or delayed
Low pay rates: operators also see a high operating and support costs for payment transactions that result in the retailer payment rates below 30% when they are usually about 50%.
Low rate of sales tracking: It is very difficult to remember where or how something was bought
Source: (Arjunwadkar, 2015)

As mentioned earlier, first mobile payment (1997) was carried out by an SMS in a Coca-Cola vending machine. The operation of the SMS payment takes place as follows: 1) buyers send a text message to pay for an item or service. 2) This text message is sent to mobile payment providers avoiding the exchange of private information between the buyer and seller. 3) The cost of the product is added to the monthly phone bill or deducted from a prepaid balance provided by mobile phone operator.

By using SMS payments, mobile phone users can pay businesses securely and quickly, purchase real or virtual goods or services and make deposits or remittances. This type of payment is particularly popular in several countries in Africa where there are large unbanked populations,

where the use of cash may be common but risky, and where smartphone penetration is low and internet access scarce (Fernandez, 2015; Lowry, 2016).

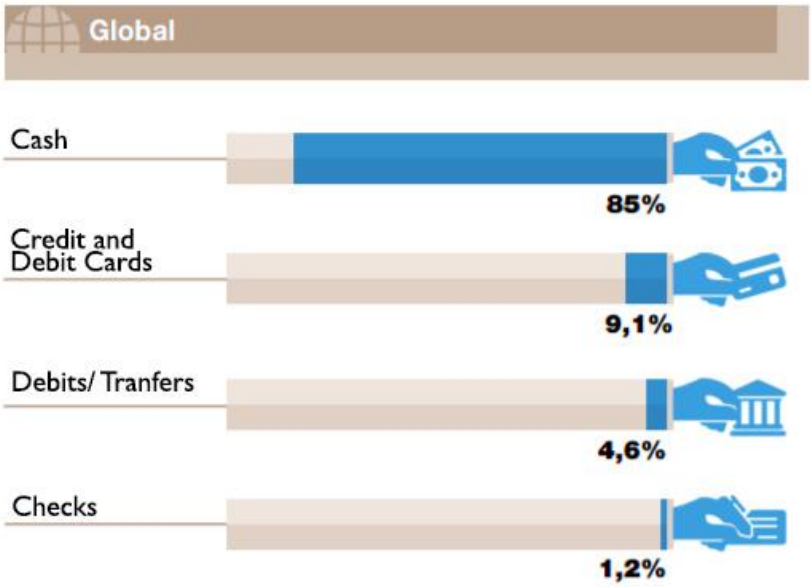
SMS payments in the United States have been very successful in campaigns to collect funds such as political contributions or contributions to certain Red Cross initiatives. The use of SMS payments for everyday transactions has seen less development (Roberts, 2016). On the other hand, certain problems regarding consumer protection have arisen in SMS payments that are billed directly to mobile phone invoices. In fact, due to cases of unauthorized third party charges on phone bills, the major mobile operators in the US have halted the offer of this service (Lowry, 2016).

Although SMS payments have their weaknesses, many companies have taken advantage of their benefits to provide convenient services to their clients. Examples of this method include vending machines throughout Europe that allow purchasing of a Coca-Cola by SMS, stamps and books in Denmark, hamburgers in Finland and travel tickets in Tokyo, Paris and Rome (Roberts, 2016).

2.4 The current standing of mobile payments

Cash is still the most common means of payment in the world. According to PwC and IE Business (2016), 85% of worldwide transactions and 60% of the value of these imports are carried out with cash (see Graphic 2). Cash remains attractive because it provides many benefits to the payer, including anonymity and gratuity. Yet is serves mainly for low value transactions, cultural habits and outdated payment infrastructures continue to contribute to its use (Capgemini & BNP Paribas, 2016).

However, the durability of cash payments is not tantamount to a stationary market. With the increase of the adoption of systems and tools of digital payment, there is a decline in the percentage of volume of cash total payments in most countries (Capgemini & BNP Paribas, 2016). This is the case in spite of the fact that technological and operational advances such as electronic banking have simplified and facilitated some of the traditional payment methods (PwC & IE Business, 2015).



Bar chart 2 -Worldwild use of traditional means of payments

Source: PwC & IE Business, 2015

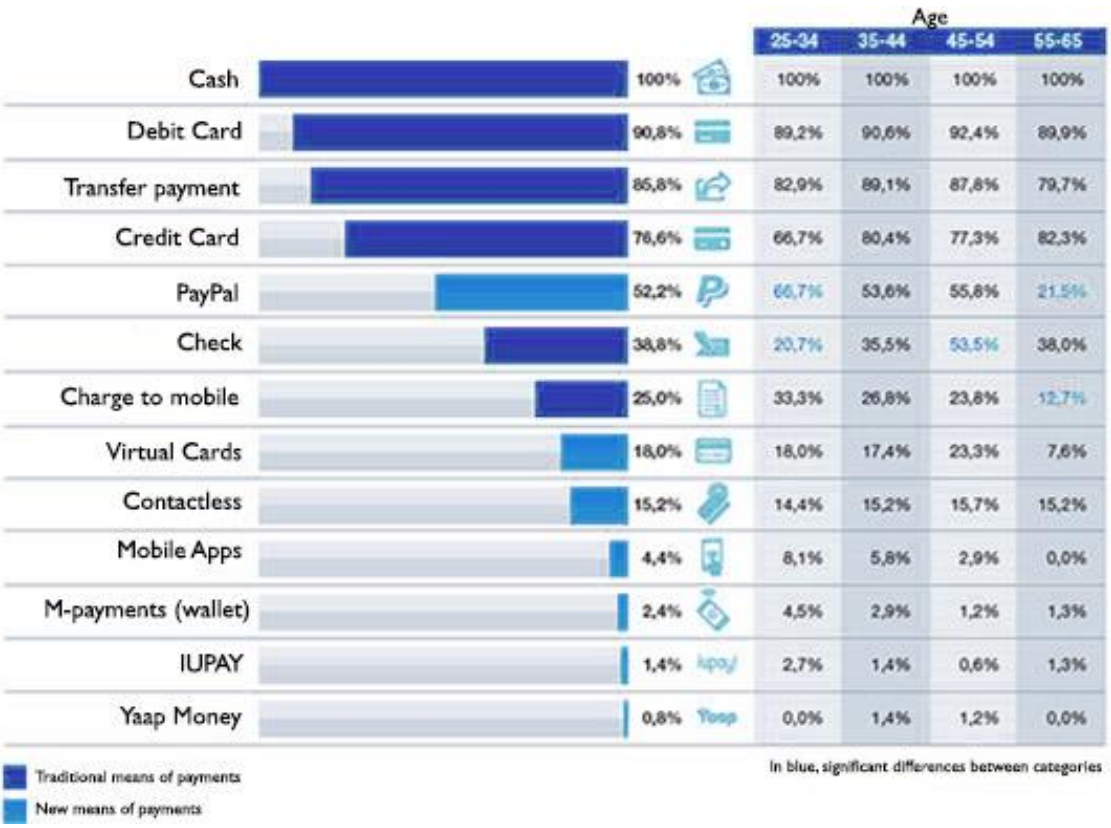
Among the new means of electronic payments are mobile payments which have begun to appear among the statistics of different means currently existing payments.

In Kenya more than 22 million people are registered to pay for purchases and supplies with mobiles (Communications Authority of Kenya - CAK, 2015) as clients of M-Pesa, a subsidiary of Vodafone, or through SMS as most of the population does not have a smartphone or internet connection. However, although similar initiatives to those of Kenya has been implemented in neighboring countries, they have not, by far, met the same success (Uwamariya, Michalik, & Loebbecke, 2016).

In Spain, as in most Western countries, although there is better access to technology, mobile payment is still among the payment methods. A recent study by PwC in Spain found that while traditional methods of payments predominate, individuals, particularly younger consumers, are beginning to introduce the most innovative payment methods on a daily basis (see Graphic 3). The study also shows that the future evolution of mobile payment systems will be conditioned by two major cross-cutting elements: security and regulation (PwC & IE Business, 2015).

Security is an important factor since no new means of payment can prosper if the user is not convinced that his/her money is not in danger. Regulation, meanwhile, faces problems to unify

due to its great impact on business models, its development in different levels (sectors, channels, products, etc.) and its geographic fragmentation.



Bar chart 3 - Means of payment used in Spain

Source: PwC & IE Business, 2015

Three major technology companies throughout 2015 made efforts to promote their mobile payment solutions on the market and achieved a significant response from the industry. Apple Pay completed its full year on the market, Samsung launched its own payment service (Samsung Pay) and Google relaunched its mobile wallet as Android Pay.

These events have served as an important means for the adoption of mobile payments. Users have shown an increased interest in mobile payments (or at least better knowledge of them) after these three companies submitted their payment systems. The Bank of America in 2014 announced 800,000 active users of Apple Pay among the 1.1 million registered users. Meanwhile, Chase Bank

in 2015 reported more than 1 million users of Apple Pay, and in 2016, when Apple Pay was launched in China, in the first hour of its launch it had 10 million registered users (Anderton, 2016).

The potential of mobile payments has also been perceived by banks around the world, which are likewise joining forces to promote the service. According to Schafer (2016), at the end of 2014 there were only seven banks that supported mobile payments, whereas by the end of 2015, 55 banks worldwide offered or were starting to offer them.

Another technology with great potential that has received special attention in recent years is *wearable*. This technology is part of the great wave of "Internet of things" (IoT), a concept that refers to the digital interconnection of everyday objects through the Internet.

Wearable technology includes technological devices designed for use either as a part of their clothing or as complements such as glasses, watches, headphones and headsets, fitness and healthcare trackers, and jewelry and fashion in general. A recent report by IDTechEx, Hayward, Chansin, & Zervos (2017) claims that the market will be worth more than $30,000 million in 2016 and will grow in three stages: 10% annually over $40,000 million in 2018, accelerating to 23% with more than $100,000 million in 2023, and decelerate to 11% reaching more than $150,000 million in 2026.

In the last couple of years, a multitude of wearables devices have been launched with the promise to change the way we perceive and interact with technology. The entities interested in promoting mobile payment have sought to unite the convenience of this technology with mobile payment systems by developing *wearable payments devices.*

In 2016, the digital security provider Gemalto announced that its contactless bracelet Celego to pay transport tickets, had won an award from Juniper Research. The bracelet was implemented in the Euro 2016 Football tournament in Lille, and the Saracens Rugby Club for fans to purchase food and beverages at the Allianz Park Club stadium (Gemalto, 2016a). The contactless wristbands company the same year also announced its collaboration with RioCard, an operator selling tickets for public transport in Rio de Janeiro (Gemalto, 2016b).

This means of payment allows micropayments by means of approaching a device to a contactless terminal by a simple wrist motion. The benefits are an increase in the speed of transactions and simplification of travel logistics, building a simple, convenient and secure base for contactless payments.

After the release of Apple's smart watch in 2014, the Apple Watch, many applications were created over two years to be used with it. The most relevant is perhaps Apple Pay which began to be marketed in 2015. Currently, payments with Apple watch through Apple Pay can be carried out in 13 countries: Australia, Canada, China, Spain, USA, France, Hong Kong, Japan, New Zealand, United Kingdom, Russia, Singapore and Switzerland (Apple, 2017).

Samsung has also entered into this dispute and has already allowed users of Android devices to pay with mobiles and the Samsung Gear S3 smart brand watch in Korea, USA, China, Spain, Singapore and Australia (Samsung, 2017; El Economist, 2016b).

Several other solutions were launched in the last year touching on the issue of wearables and mobile payments. Some, including those mentioned above, received increased attention in 2016. Yet some companies have gone beyond smart watches and offer rather interesting payment solutions. Microsoft, for example, allows users of its physical activity monitor (Microsoft Band 2), to pay at Starbucks. In the United States, with the physical activity monitor Jawbone UP4 bracelet it is already possible to pay by American Express in partner shops. The Amex card finally authenticates through the Jawbone app by just sliding the wrist at the POS - with or without a phone.

In the banking sector, Barclays is the most innovative in the field of *payments wearables devices*. It allows their clients, or clients of any other bank that owns the app payment BPAY, to pay for goods and services in the UK wearing a jacket of the Lyle & Scott brand (see Figure 7) or jewelry from Topshop equipped with a contactless chip integrated payment linked to the BPAY application (Barclaycard, 2016).

Figure 7 - Payment with Bpay with a Lyle & Scott jacket

Source: Barclaycard (2016)

2.5 The current ecosystem of mobile payments

The changes taking place in the sector of means of payment are not only technological, economic or market oriented. They go further affecting the essence of the exchange. To fathom the mobile ecosystem, it is necessary to properly understand the business models used by financial institutions and other participants.

In the traditional financial products of the past, the market strategy was oriented toward the product. The client was another element in the flow of the transaction. Payments by card, transfer or by direct bank debit were regulated so that banks had a decisive role in all phases of the process. They were thus able to generate significant revenues for their participation.

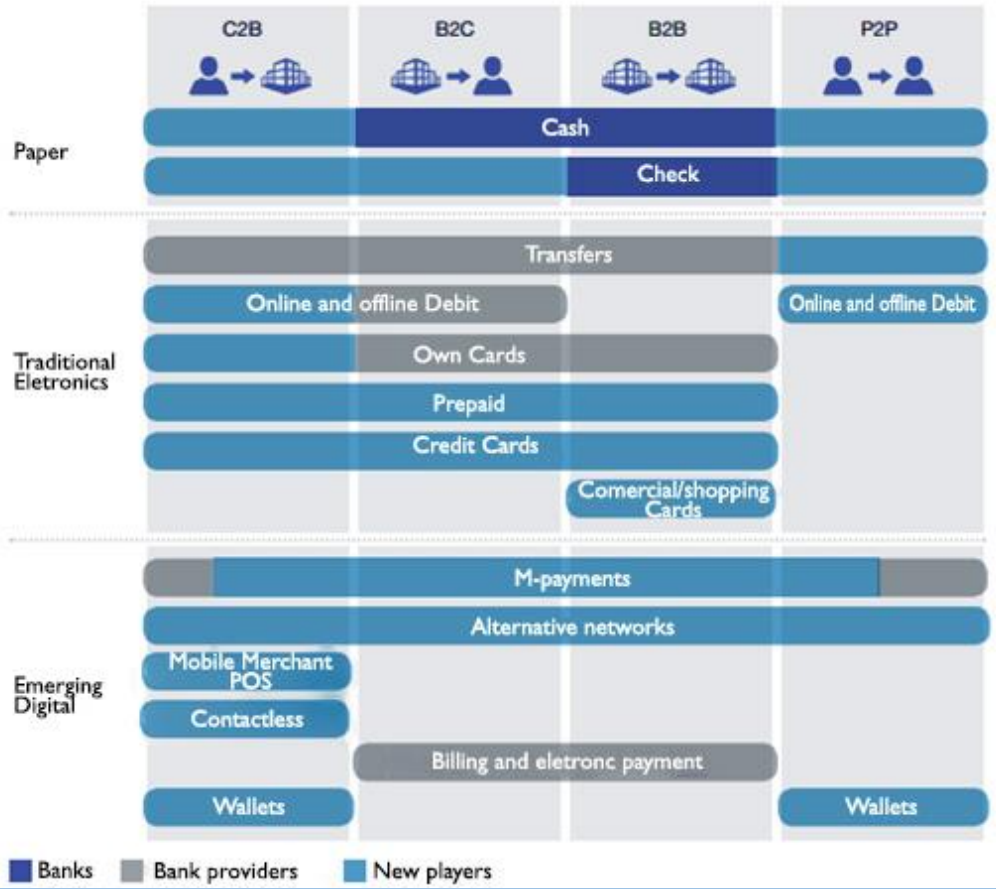
Thus there was a clear hegemony of banks in the traditional system of means of payment (cash, checks, cards, transfers, etc.). However, with the passage of time new competitors have made an appearance confronting financial institutions in areas of traditional banking business. Currently there are still areas of traditional business that are subject to dispute and a new territory of income (denoted "emerging digital" in the graph) offering opportunities for all (see Table 5).

Constant changes in consumer preferences have been key to a more diversified scenario. With the passing of time, the consumer has access to increasingly diversified information that

completely changes the decision making process. Consumers are more demanding and more capable to influence the decisions of their friends and family. Today, businesses are routed toward the customer and to meet this demand provoking the emergence of a more diversified stage with new players and innovative financial services that as a whole revolve around customer needs.

Thus, the new system allows multiple holes for disintermediation, opens the door to new competitors, provides opportunities to offer other services on an equal basis, lowers margins and ultimately suggests that business models will have to change in depth to adapt to the new realities of the sector (PwC & IE Business, 2015).

Table 5 - The current scenario of the new means of payment



Source: PwC & IE Business, 2015)

The emerging digital sector that offers new proposals that are revolutionizing the market deserves special attention because of its relevance and innovative participation in the scenario of payment. According to B.I. Intelligence (2016), "We've entered the most profound era of change

for financial services companies since the 1970s brought us index mutual funds, discount brokers and ATMs" and that is the result of the rise of the emerging digital sector.

Within this segment are included all financial services accessed and carried out wiht a mobile phone, including mobile wallets and, of course, mobile payment both online and in a point of sale. The subsegment of mobile financial services, or mobile money, possess an own ecosystem as they include different services and require the collaboration of different actors. According to Shrier, Canale & Pentland (2016), this ecosystem has five main participants although not limited strictly to them:

Mobile Network Operators (MNO) and Communication Service Providers: Offer communications service and infrastructure for operation. In some regions, where they are legally authorized, they enter the financial sector through the issuance of electronic money and the offer of payment services. In addition, some are serving as mobile strategy advisors for industries that are new in this field (see Figure 12).

Banks and FinTech companies: create and offer banking services that are available for mobiles. The *startups* of FinTech have been able to move faster than traditional banks, but both entities are responsible for providing financial experience as well as support and promote new offers banking services.

Agents and Intermediaries: These players are often the point of contact with the consumer, and usually are the face of the offer of mobile money. They mainly carry out the operational functions for the service such as opening accounts and transaction management.

Retailers and Employers: They can make payments for business to consumer (B2C) transactions. This category may be broad ranging from shopping in stores to payments of public service bills, to paychecks, as well as B2B transactions.

Regulators: They seek to provide a regulatory framework to protect individuals and provide stability to the financial system, while fostering a favorable environment for innovation. In this sense, telecommunications and financial regulators will have to cooperate.

The objective of this thesis leaves no doubt that it is essential to expand the mobile payment market to create a high degree of interconnectivity among those interested in promoting this service. Hence it is important to involve a number of large and small diverse, traditional and novel, global actors as is the trend in recent years. However, consider that networks are also critical factors for the ecosystem component and that traditional lines of industry are increasingly blurred,

particularly among mobile service providers and finance. It is thus possible to find both opportunities for new business models, as well as unexpected competitive threats (Shrier, Canale & Pentland, 2016).

Thus, it is possible to understand that the scenario in which develops mobile money is somewhat delicate, and possibly for these reasons mobile payment still is not an everyday payment tool.

Moreover, mobile payments also have their own ecosystem which can, of course, be very complex due to the interconnections of the above mentioned participants as well as six others. The relations between the participants in the ecosystem of mobile payments play a key role in its development and operation. This occurs because it is an innovation that to be generated involves different skills and requires a long procedure to reach consumers as a safe and effective solution. Figure 8 summarizes the ecosystem englobing mobile payment and the key participants responsible for the daily use of this method of payment.

Figure 8 - Mobile Payments Ecosystem

Source: Author

Despite this broad ecosystem where mobile payments are developed, this means of payment is in its infancy. The current scenario may appear to be quite developed, but can still change considerably and nobody knows how it will evolve in the medium term. This is particularly the case when we consider that new ways of conducting financial transactions, and new types of money are emerging in the world. Right now it's easy to imagine a future where we are all connected, with synchronized transactions, and hardly anyone using cash. However, finding ways to reach that reality can be a great challenge.

2.5.1 The regulation of mobile payment in Europe

As in other aspects of finances, regulation is a key factor in the development of the means of payment and can play a role in the viability of the different business models in different countries. So far there is no specific regulation for mobile payments, but the legislative powers are beginning to move in that direction.

The first *Payment Service Directive* (PSD 2007/64/EC), implemented in 2009, aimed to create a single payment market for the European Union and thus promote innovation, competition and efficiency within the Community. The PSD remains in effect and has allowed to resolve the difficulty and rising costs of cross-border operations when each State of the European Union has its own rules, stimulating competition among the providers of services.

Subsequently, due to the constant technological advances, it was necessary to revise previous legislation and on the 8th of October 2015 the European Parliament approved the proposal from the European Commission to create safer and more innovative payment methods. The Directive on Payment Services, PSD2 (European Commission, 2015) offers EU Member countries a 2-year deadline to implement the necessary changes to national laws to comply with the new rules.

This directive is part of a legislative package that included a regulation of multilateral interchange fees. On the whole, the regulation and the second payment services directive will be implemented in 2018 and comprise the following ma jor changes:

- Introduction of strict security requirements for the initiation and processing of electronic payments and the protection of consumer financial data

- Opening the EU payment market for companies offering consumer or business-oriented payment services based on the access to information about the payment account – the so called "payment initiation services providers" and "account information services providers"
- Enhancing consumers' rights in numerous areas, including reducing the liability for non-authorised payments, introducing an unconditional ("no questions asked") refund right for direct debits in euro; and
- Prohibition of surcharging (additional charges for the right to pay e.g. with a card) whether the payment instrument is used in shops or online.

The project to regulate the charges of rates card transactions (the commissions the merchant's bank pays the buyer's bank) sets a series of maxima of 0.3% of the value of the acquisition transactions with a credit card and 0.2% with a debit card. In the latter case, the member states may lower the ceiling and also impose restrictions on commissions in absolute terms. These conditions coincide with the legal provisions in force in Spain since September 2014. The goal of placing a cap on interchange fees is for this constraint to press downward on the commission charged by banks on the merchant (the so-called rate discount which is not regulated), which in turn could benefit the final consumer. The European Commission expects the reduction in commissions to save 6,000 million Euros annually for the European payment system (PwC & IE Business, 2015).

2.6 The role of blockchain and cryptocurrencies in the evolution of mobile payment

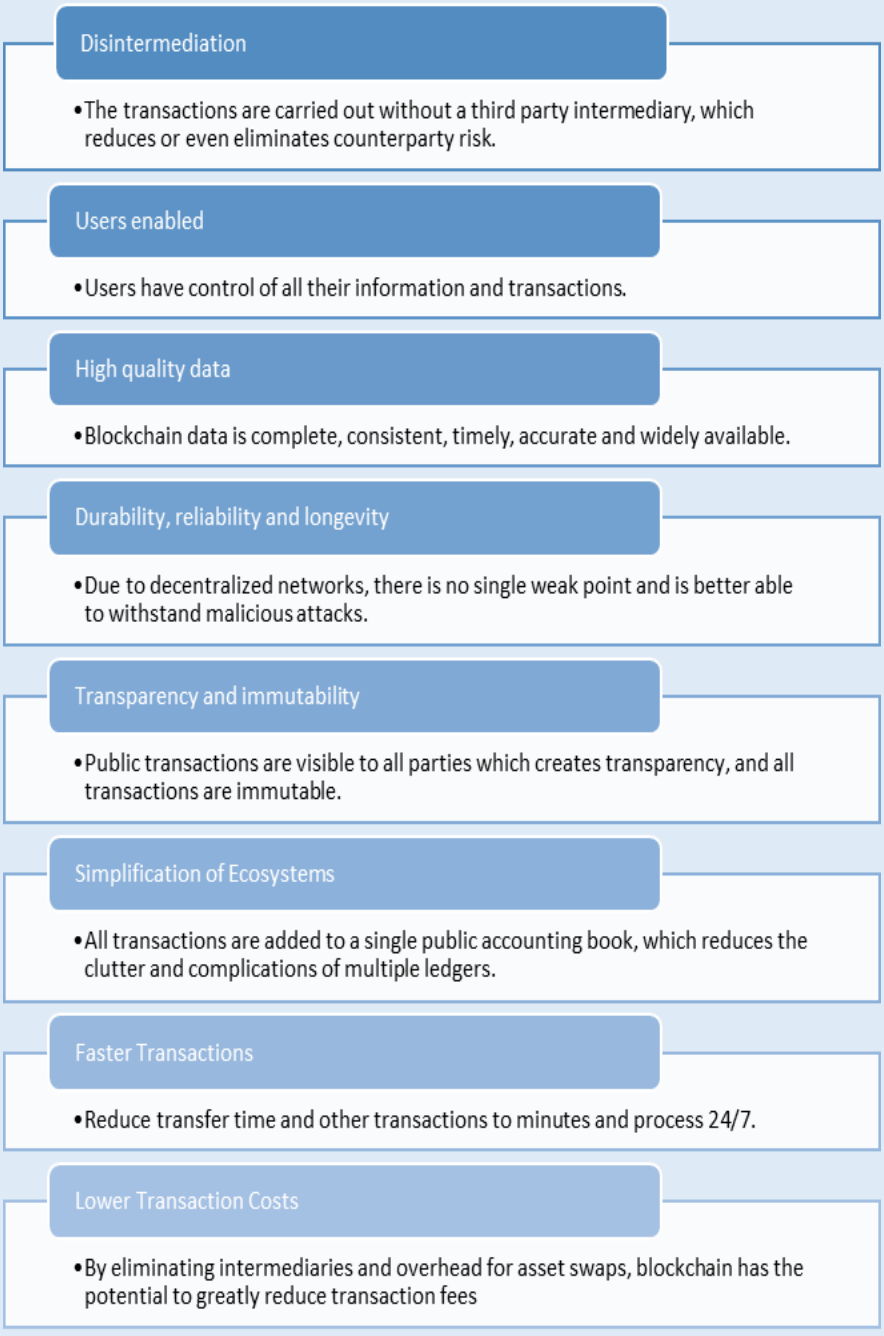
There are many technological advances that meet the different needs of the market that took part in a great number of experiments carried out with mobile payments since 1997.

Among these solutions, the most recent is blockchain (also called chain of blocks) which promise to make most financial processes democratic, secure, transparent and efficient. Ibáñez-Jiménez (2016, p. 1) explains that blockchain "... is basically based on integrating computer files, related through matrices by identifiers or codes (e.g. alphanumeric) as combinations generated with algorithms, in multiple computers and identical in all. Therefore, when a sufficient number of users participates in the system, it allows a perfect, irreversible and synchronous identification of the content embedded in the files."

According to Shrier, Canale & Pentland, (2016), blockchain is a technological innovation that allows transparent interaction of the parts in a more reliable and secure network. It distributes access to data and has the potential to change not only the financial sector, but also many others, including health, logistics and real estate. Indeed, investment in entrepreneurship in the field of blockchain was $1 billion in 2015 and is expected to grow to $10 billion in 2016 (Torpey, 2016).

In principle, the technology was created to manage the Bitcoin cryptocurreny, Yet Blockchain technology, in other areas of economic activity, can offer various advantages that, in the eyes of some entrepreneurs, investors, international organizations and governments, can revolutionize the global financial system. Table 6 depicts the main benefits of the blockchain technology which is likely to be fully integrated into mobile payments in the future.

Table 6 - Benefits of the Blockchain technology for the financial industry



Source: Author, from Delloit (2016)

The attention currently paid to blockchain can be compared to that of the inception of the Internet. This indicates that this is a new model based on decentralization, possibly breaking down borders as the Internet did. This is especially clear through its application to large number of

processes: domestic payments, international payments, contracts, records check, etc. .... in short, any transaction is disruptible with blockchain based applications.

The arrival of blockchain in recent years has offered the global financial services industry an additional energy to generate new financial services. Yet it is not only in this area of business that blockchain is gaining currency. The *Blockchain Capital* (formerly known as *Crypto Currency Partners*), for example, has managed to raise $7 million for its second inversion fund for projects related to Bitcoin and blockchain specifically focused in cases of non-financial use (Amit, 2015).

The company GrowthPraxis published in 2015 a report identifying 20 examples of use of blockchain technology for non-financial services. This was done by closely monitoring new companies that are already operational or in hidden mode. Examples include the following: the digitization of documents/contracts and proof of ownership for transfer (Colu); Decentralization of patient records management (Bithealth); proof of ownership of digital content (Blockai, Bitproof, etc.); provide a digital identity to protect consumer privacy (Trustatom, Followmyvote, etc.); create value transfer points for shared travel (La'Zooz); decentralized prediction platforms for stock markets, politics, etc. (Augur). In short, it is very possible that this new technology will be part of our daily life in a very short time.

In this way, and knowing its great potential for both financial services to non-financial, it is important to include this technology in this analysis because everything indicates that it will be an important step in the process of commercialization and adoption of mobile payments.

Countries like China (Long, 2016), the United Kingdom (UK Governmet Office for Science, 2016), Japan (Rizzo, 2016), or even the Vatican (O'Ham, 2016) are exploring electronic versions of their own *criptoxicity* and legitimizing digital currencies by incorporating its existing regulatory framework, while tax havens like Barbados (Allison, 2016) are issuing fiduciary digital currency and trying to attract *startups* of digital currencies.

The corporations most interested in blockchain are banks and other financial institutions. A recent study by the IBM Institute for Business Value (2016) between banks and global institutions reveals that commercial solutions for the financial area are rapidly being adopted by such organizations. In addition, the study showed that 65% of banks expect to have blockchain solutions in production over the next three years, while 15% of banks and 14% of other types of financial institutions interviewed intend to implement them already in 2017.

In fact, the Santander bank in the UK announced the development a new payment application in collaboration with the *startup* Ripple. It counts with technology that is already in use by personnel of the entity (Vazquez, 2016). This entity estimates that use of blockchain by banks can reduce infrastructure costs by up to 20,000 million dollars a year (Amit, 2015).

the other hand, the Santander bank in collaboration with UBS, BNY Mellon, Deutsche Bank, market operator ICAP and startup Clearmatics have used blockchain technology in the project "Utility Settlement Coin" (USC) intended to investigate and promote the use of money digital between financial institutions and central banks (The Economist, 2016A).

Finally, Spanish banks have joined forces through the Society of Payment Procedures SL, affiliated by 27 banks operating in Spain. Its board of directors is composed of representatives of CaixaBank, BBVA, Banco Santander, Banco Sabadell, Bankia Banco Popular, Kutxabank and Unicaja. They therefore intend to jointly manage the Bizum payment platform, a system that will bring together the majority of entities in the country and standardize the banking transactions of companies and individuals reverting to blockchain technology. This is the first step in implementing a common platform with which operations can be carried out instantly and through all digital channels (Bronte, 2016).

The new scenario of the coming years will see major changes in the financial system and the way people conduct financial transactions. For mobile payments this supposes a breakthrough since with this technology offers the possibility to add more value to the user with a unified system, as well as increase security and convenience during transactions. Although drawbacks will surely arise in this process, we may be at a road of no return, because, even if blockchain were not to work completely, other improved technology will most likely be developed to reach the objectives of decentralizing the system.

2.7 Mobile payments perspectives

As noted in the preceding paragraphs, the international scene of payments is changing rapidly and, although there is a long way to go to attain mass acceptance of mobile payments, daily use of these payment methods is very close.

This statement is true for several reasons. First, consumers are increasingly more demanding which puts companies under pressure to evolve and improve their services if they want to conveniently serve the needs of its customers. On the other hand, the payment system itself has

many advantages such as high mobility, ease of use, immediate character, optimization of buying and selling and process, greater security, comfort, possibility of integration with other services, etc.

In addition, through the use of mobile payments, retailers are put in a position where they can use the payment data to improve their assistance and information for their customers. This effect can be amplified by linking relevant services such as loyalty programs, personalized offers, purchases and orders, product comparisons and more (MOBGEN, 2015).

To conclude, banks and credit card companies, entities that have never before had threats, are now subject to fierce competition from a new generation of digital service providers whose mobile banking solutions are often decentralized, much cheaper, more transparent and customer-oriented services used by their current customers.

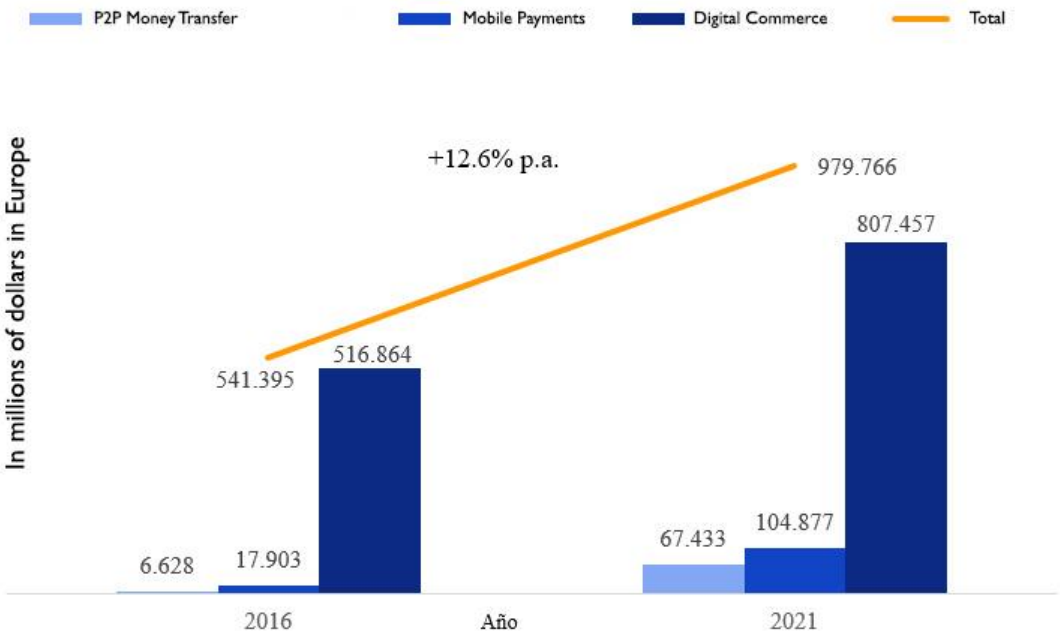
The notions presented so far assume that integration of mobile payment solutions will suppose great value to retailers and consumers. At the same time, with all the potential for industry of mobile payments, its proper application implies for its participants in the ecosystem a successful formula, manifesting that this is the future means of global payment.

According to Bohnhoff (2017), the digital payments sector, with a global transaction value of around 2.221 million dollars in 2016, accounted by far for the largest share of the total FinTech market. When referring to digital payments we include digital commerce, mobile payments at the point of sale, and transfers between two individuals through any mobile device (P2P).

Overall industry digital payments are expected to double its transaction value in 2021 and reach 4,644 million. This is based on an expected mobile payments growth of more than 8 times between 2016 and 2021 at an annual growth rate of 52% (Bohnhoff, 2017). These forecasts explain why most service providers are engaged in this new market.

Specifically, in Europe, the progress of digital payments is moving slower than in other continents like America and Asia. Yet there is evidence that the scenario is evolving and a lot of progress in the field of mobile payments is expected in the coming years (see Graphic 4).

It is expected that the future will bring changes in digital commerce starting with the development of digital portfolios as PayPal, Apple Pay or the former Google Wallet. In addition, with the expected revolution FinTech proposes innovative solutions that are more decentralized and accessible payment systems. It is also very possible that with time payments with credit cards will offer a less lucrative return for card networks, banks that issue cards and affiliated businesses.



Bar chart 4 - Forecast of the value of digital payment transactions in Europe

Source: Data from Bohnhoff (2017)

On the other hand, one expects an immediate process of convergence and standardization of the means of payment ecosystem. The how and the when will depend on the needs and expectations of customers as well as the ability of companies in the sector to generate common solutions. In the process of union of the two interests there are a number of trends, global, sectoral and technological influences. Their confluence depends on how the development of the landscape of the means of payment throughout the world (PwC & IE Business, 2015) develops.

Global trends that will have the strongest impact in the coming years in payment systems are characteristic of contemporary society spanning all sectors and industries. In almost all the of them the catalyst is the Internet and digital technology, and the main effect is the increased power and influence of consumer decision. According to the PwC, some of the trends that will further enhance mobile payments in the coming years are:

- Mobility: The large and growing adoption of mobile devices throughout the world has resulted in radical changes modes of purchase of citizens as well as the emergence of new business models. The geolocation application offers the benefit of knowing the exact

location of customers at all times and opens doors to new ways to attract customers through more innovative campaigns of marketing.

- Users are changing and new generations of "digital natives" have more resources to quickly recognize the advantages (and disadvantages) of new technology, including technology related to payment systems (Goodrich & De Mooji, 2014). Therefore, the user has more and more power and becomes a prescriber of the products he/she uses or recommends, and can even generate viral content. The use of social networks does not stop growing, and not only for the entertainment it offers, but also for its offer of content that serves as a reference for the decision-making of numerous users in everyday life. By 2015 the number of global social networking users was 2.14 billion and is expected to reach 2.95 billion by 2020, which corresponds to almost a third of the global population (Statista, 2016). In addition, social networks have a great potential to become a payment channel, especially between private individuals. Facebook (which in March 2015 had more than 1.4 billion active users and competes with China and India for being the most populous country in the world) recently announced that it will allow money transfers through its Messenger messaging application. Studies have been carried out on this subject, with evidence that social networks significantly affect the online and offline purchase decision process (Goodrich & De Mooji, 2014), the process of adopting new technologies (Risselada, Verhoef, & & Bijmolt, 2014) and, specifically, the adoption of mobile payments (Koenig-Lewis, Marquet, Palmer, & Zhao, 2015).
- Big Data: Enables transformation of data into patterns of customer behavior to gain a competitive advantage and is also a useful tool for early detection of fraud. Big Data draws on the large amount of information generated in social media and electronic transmission. It is expected that revenue from sales of large volumes of data and applications and business analysis applications and services tools will increase 50% in four years, from almost 122 billion dollars by 2015 to more than 187 billion dollars in 2019 (International Data Corporation, 2016).
- Cloud Computing: The Cloud is cheaper than technological architecture or traditional logic and provides great flexibility in the use of information. Until his emergence any company was required to create a complex and rigid technological

infrastructure hard to adapted to its real needs. The Cloud, however, adapts to any demand. According to estimates by Gartner, the shift toward the Cloud will yield more than one billion dollars in spending in 2020 (Cardenal, 2016). An example of the potential of *cloud computing* is Salesforce.com, one of the main drivers of the cloud computing revolution and one of its biggest beneficiaries. The company is a pioneer in the computer industry and has built a diversified portfolio of services around CRM. Salesforce has experienced an impressive growth in revenue in recent years with total revenues in the second quarter of 2016 at $ 2.04 billion, up 25% from the previous year. In constant currency terms, Salesforce.com revenue has increased 26% (Cardenal, 2016).

- Wearables: These technologies, especially smart watches, are in an early stage of implementation and presumably will receive a big boost in the coming years. On the other hand, as already noted in point 2.4, it is a market in constant development with potential surprises especially in the field of payments.
- IoT: The Internet of Things is among the great revolutions in progress. More and more devices of diverse nature are connected to the Internet and provide information in real time, or autonomously perform certain types of actions. The typical example is the refrigerator that detects that a basic food is missing and purchases it in the supermarket. It can also be used to facilitate payment in stores, identifying the products that the customer takes and automatically charging them on their way out. Although the proliferation of such devices has gone unseen, their progression is astounding. According to estimates by Cisco, by 2014 there were 14 billion connected devices on the market, and by 2020 they will exceed 50 billion.
- Blockchain: This technology to promises to revolutionize payment transactions worldwide. The blockchain industry and the ecosystem in 2016 has undergone major changes, both positive and negative, as for cryptocurrencies and their respective blockchain of very different utilities. Table 1 lists the companies that stood out in 2016 for their great growth in market value and illustrates the importance of this trend in the market development of mobile payments.

Table 7 - Blockchain companies standing out in 2016

Business	Price in January 2016	Price in December 2016
Bitcoin	$ 432.28	$ 982.44
Ethereum	ETH = $ 0.84	ETH = $ 7.6; ETC = $ 1,12
Ripple	$ 0.0059	$ 0.0062
Monero	$ 0.47	$ 13.6
Dash	$ 3.29	$ 10.2
Sttemit	Steem = $ 1.03, SBD = $ 1.45	Steem = $ 0.15; SBD = $ 0.99
Zcash	$ 2.3	$ 49
Counterparty	Counterparty	Counterparty

Source: Pérez (2016)

In line with the above, we can expect that the characteristics of payment gradually involve in all kinds of everyday objects. Almost all personal items, from cars to smart TVs, may participate in payment transactions. This will allow customers to pay even faster and more easily. Physical contact is not strictly necessary when money is exchanged digitally. Waiting times will be reduced to a minimum or completely eliminated. When leaving a parking lot, the length of stay will be registered automatically and payment will take place by nearing the phone to a reader/display to confirm the amount. This could be accomplished directly from the digital display inserted into the dashboard.

The protection of data and privacy, especially in the financial sector, must make significant progress in the coming years. The major current wager is on biometric methods to replace conventional authentication systems such as the PIN, passwords and cards to ensure a higher level of security. Applying of personal methods, including fingerprint, face and iris prints recognition, are the best known. There is even talk of more sophisticated authentication methods using highly individual physical characteristics such as heartbeat, vein structure and echoes of the skull that increasingly offer more security and are more resistant to attacks from hackers and other cybercriminals (Pritchard, 2015).

Regarding the question of whether mobile payment is truly the payment method of the future, we must answer no. Mobile payment is the payment method of the present. The work and

research carried out seek to improve procedures and adapt to the constantly changing consumer needs and technological innovations. Mobile payment is a payment method that already exists and operates in many countries. Although its use is not yet comparable to cash, it has a strong potential to expand and will certainly increase its present in the daily lives of consumers.

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CAPÍTULO 3

INTEGRACIÓN DE SERVICIOS ADICIONALES Y DESARROLLO DEL PAGO MÓVIL

En este capítulo se contextualizan y se clasifican los distintos servicios móviles. Además, se describen conceptos asociados al marketing móvil y se comenta la relevancia de los servicios móviles para el desarrollo del pago móvil desde una perspectiva tanto empresarial, como del marketing. De este modo, este capítulo permite al lector explorar cómo el marketing móvil puede generar valor tanto para el cliente como para el comerciante, y en este contexto conocer nuevas maneras de crear estrategias para el incremento de la adopción del pago móvil en los próximos años.

3.1 Conceptualización de marketing móvil

La creciente adopción de los dispositivos móviles y el aumento del uso de aplicaciones móviles no se limita a ofrecer oportunidades únicamente a empresas tecnológicas, sino que también brinda a los minoristas la oportunidad de explotar un nuevo canal para relacionarse con el cliente. En estos dispositivos es posible combinar las funcionalidades del teléfono con la búsqueda de información, el pago y la interacción con el cliente antes, durante y después de la compra, lo que incluye el momento en que están dentro de la tienda comprando o eligiendo lo que comprar. Un dispositivo móvil es un compañero permanente para el consumidor, una puerta de entrada a una relación entre el consumidor y el comerciante, constituyendo un canal suplementario ideal para la venta a distancia y la venta minorista física (Shankar, Venkatesh, Hofacker, & Naik, 2010).

Los dispositivos móviles tienen aún más potencial, ya que la relación entre el consumidor y los dispositivos móviles es cada vez más cercana y continua. Se trata por tanto de un importante medio para los comerciantes, pues les brinda la oportunidad de generar valor para el cliente a través de servicios adicionales de interés para el consumidor, en los cuales es posible integrar estrategias de marketing capaces de potencializar la relación comercio-consumidor.

Todo este potencial ha dado paso al desarrollo del llamado marketing móvil. De acuerdo con la *Mobile Marketing Association*, marketing móvil es "un conjunto de prácticas que permiten a las organizaciones comunicarse y comprometerse con su audiencia de una manera interactiva y relevante a través de cualquier dispositivo móvil o red".[3]

El impresionante potencial del mercado del marketing móvil se pone de manifiesto en que, tomando como base el año 2.015, la industria global va a expandirse a una tasa de crecimiento anual compuesto del 28.1%, llegando a los 98.85 mil millones de dólares en 2021[4].

Estas cifras son el resultado de la creciente penetración de los dispositivos móviles en la población, pero también de las diversas ventajas proporcionadas por el marketing móvil. En una revisión de literatura realizada por Ström et al. (2014), se verificó que el marketing móvil ofrece las siguientes ventajas a los minoristas: (1) es un canal más efectivo que los medios tradicionales, la promoción de ventas y el marketing directo para la comunicación dirigida a la marca y a las ventas; (2) ofrece oportunidades para optimizar, personalizar y mejorar las experiencias de compra en la tienda, el uso del producto y otras interacciones post-compra, de manera que la experiencia

[3] http://www.mmaglobal.com/wiki/mobile-marketing, accedido en mayo de 2017.
[4] http://www.marketsandmarkets.com/PressReleases/mobile-marketing.asp, accedido en mayo de 2017.

de servicio puede alcanzar nuevos niveles de valores percibidos y satisfacción. Estos nuevos niveles de "deleite del cliente" pueden contribuir a la imagen de marca, fomentando la lealtad y el reclutamiento creciente de los consumidores; (3) aumenta el valor de las inversiones de marketing existentes, ya que se agrega la interactividad a los puntos de contacto existentes de la marca, mejorando el procesamiento de la información de los consumidores, lo que resulta en efectos de marca mejorados. (4) el potencial de estas ventajas para que sean más duraderas está aumentando, ya que los vínculos estructurales y el desarrollo de la red de socios que respaldan esas ventajas van siendo optimizados con el paso del tiempo.

Por otro lado, para maximizar el potencial de esta forma de comunicación comercial, es necesario optimizar los atributos inherentes al marketing móvil, como son la personalización, ubicuidad, interactividad y localización (Bauer, Reichardt, Barnes, & Neumann, 2005). Para ello es necesario el desarrollo de un programa de marketing móvil realmente efectivo, lo cual resulta ser bastante más complejo y difícil de crearse que los métodos tradicionales de marketing digital.

Los responsables del desarrollo de un programa de marketing móvil deben preocuparse en planificar, implementar y probar el sistema para múltiples dispositivos (teléfonos inteligentes, tabletas, ordenadores portátiles, ordenadores de sobremesa, etc...) y diferentes sistemas operativos, para que el sistema se ajuste a las particularidades de todos estos dispositivos; deben considerar que la inmediatez, la ubicación y características de personalización de los dispositivos móviles aumentan la necesidad de desarrollar un sistema en el que se reflejen atributos tales como distancia a una tienda (ubicación), o el historial de comportamiento de compra (personalización); y finalmente tienen que conseguir la cooperación de los minoristas para instalar y actualizar el contenido que se quiere difundir (Berman, 2016).

A pesar de las dificultades, la implementación correcta del marketing móvil forma parte de una importante base para alcanzar una ventaja competitiva sostenible ya que contribuye a la mejora de la experiencia del consumidor hacia la marca, y refuerza o añade valor para el cliente (Störm et al., 2014).

Por otro lado, aunque el ecosistema de los pagos móviles está madurando, la industria se enfrenta con problemas para lograr que, tanto comercios como consumidores, adopten el pago móvil hasta el punto de convertirlo en un método de pago de uso masivo, y ello pese a que el método ofrece beneficios a ambas partes: características de seguridad mejoradas, compras más rápidas, y posibilidad de integración de servicios de marketing.

Desde una perspectiva empresarial, la integración del marketing móvil con los sistemas de pagos móviles puede representar una gran oportunidad para la recopilación datos información útil sobre el comportamiento de compra y consumo basada en evidencias de compra (Pousttchi & Hufenbach, 2013). Con los datos generados las posibilidades son diversas, y los comerciantes de tiendas físicas tienen una gran oportunidad de conocer a sus clientes y sus preferencias, permitiéndoles realizar análisis del perfil del cliente, de sus valores, y del esfuerzo de adquisición, y de esta manera competir en igualdad de condiciones con los comerciantes en línea (Kotler, 1994; Labe, 1994).

3.2 Clasificación de los servicios móviles

Los servicios móviles son herramientas innovadoras e interesantes tanto para los minoristas como para los clientes, aunque su prevalencia depende en gran medida de las mejoras tecnológicas y de la usabilidad, así como de la adopción por los usuarios. Por lo tanto, el éxito de cualquier oferta electrónica no es una consecuencia inevitable de su mera existencia, y es por eso que la adopción de los servicios móviles se enfrenta con múltiples barreras (Gebauer, Shaw, & Gribbins, 2010). En particular, para que se alcance el éxito deseado, los usuarios necesitan reconocer los beneficios de estas tecnologías ante los métodos convencionales (Pousttchi, Turowski, & Weizmann, 2003).

Estudios relacionados con el comercio móvil sugieren que existe un interés entre los consumidores de servicios móviles concretos: ticket móvil de transporte públicos (Di Pietro, Mugion, Mattia, Renzi & Toni, 2015), ticket móvil de aparcamiento (Mallat, Rossi, Tuunainen, & Öörni, 2009), redes sociales (Liébana-Cabanillas, Herrera & Guillén, 2016), información personal y marketing personalizado (Eastin, Brinson, Doorey, & Wilcox, 2016), programas de fidelidad (Lim & Lee, 2015), servicios de geolocalización (Lee & Rha, 2016), cupones móviles (Khajehzadeh, Oppewal, & Tojib, 2014), marketing móvil (Ström, Vendel, & Bredican, 2014), etc.

Por otro lado, Pousttchi & Hufenbach (2014) han analizado los servicios de comercio móvil e han identificado 12 categorías de servicios móviles que denominan como *Building Blocks* (BB). Los BB incluyen el servicio de pago móvil y otros 11 servicios móviles diferentes (Pousttchi & Hufenbach, 2014), representados en la figura 9:

Figura 9 - Servicios adicionales móviles

Fuente: Autor (Basado en Pousttchi & Hufenbach, 2014)

Cupones móviles (CO): son un tipo de cupón digital que los comercios pueden enviar a los consumidores como un incentivo para comprar en un determinado comercio, así como para mejorar las relaciones entre la empresa y el consumidor, generando nuevas ventas y recomendaciones adicionales (Grewal et al., 2011; Pousttchi & Hufenbach, 2014). Este comprende el proceso de envío, recepción, reenvío y canje de un cupón digital por dispositivos móviles. Los cupones móviles tienen como principal objetivo un aumento en las ventas gracias a las reducciones de precios ofrecidas en forma de cupones de ahorro de dinero, complementos u otros valores (Dickinger & Kleijnen, 2008). El bajo costo de generación y entrega facilita la distribución masiva de grandes volúmenes de cupones móviles (Friedrich, Gröne, Hölbling, & Peterson, 2009). Este tipo de servicio también puede ser utilizado en campañas de marketing integrado para complementar otras medidas de marketing (Batra & Keller, 2016). McDonald's, Carrefour, Burger King y Levi's son algunas de las empresas conocidas que utilizan el cupón móvil como una estrategia de marketing móvil (véase figura 10).

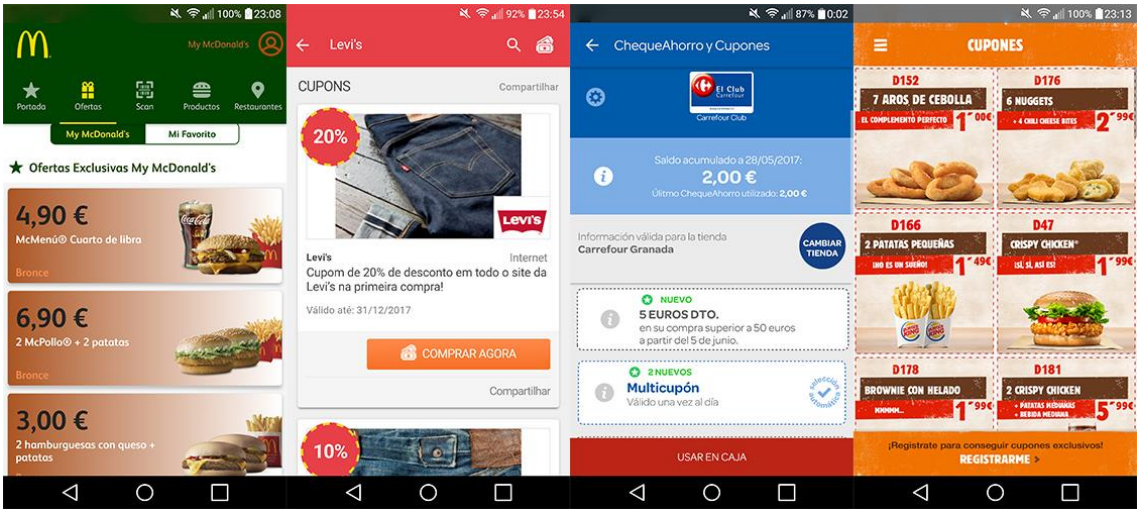

Figura 10 – Ejemplos de cupones móviles

Fuente: Autor[5]

Listas móviles (SL): consiste en todo tipo de lista que se pueda generar por los clientes a través de dispositivos móviles, como las listas de deseos, de regalos, de productos, o de compras en general (véase figura 11). La lista escrita incluye una ayuda específica a la memoria (Block y Morwitz, 1999) que codifica las intenciones de compra de los consumidores (Spiggle, 1987). Las listas móviles pueden ofrecer información relacionada con la intención de compra de los consumidores, asociada a un perfil de comprador, por lo que son consideradas herramientas del comportamiento de compra pre-planificada (Schimidt, 2012). Por tanto, estas listas son una interesante herramienta para mejorar las ventas utilizando información acerca de los deseos del cliente y enviando recomendaciones para la venta cruzada y la venta ascendente, ofreciendo descuentos, o incluso haciendo un regalo promocional basado en los elementos enumerados como incentivo de compra.

[5] Captura de pantalla realizada por el autor de las aplicaciones Mc Donald's España, Cuponeria Cupones y Ofertas, Mi Carrefour, Burguer King® España, disponible en Google Play. Accedido en mayo de 2017.

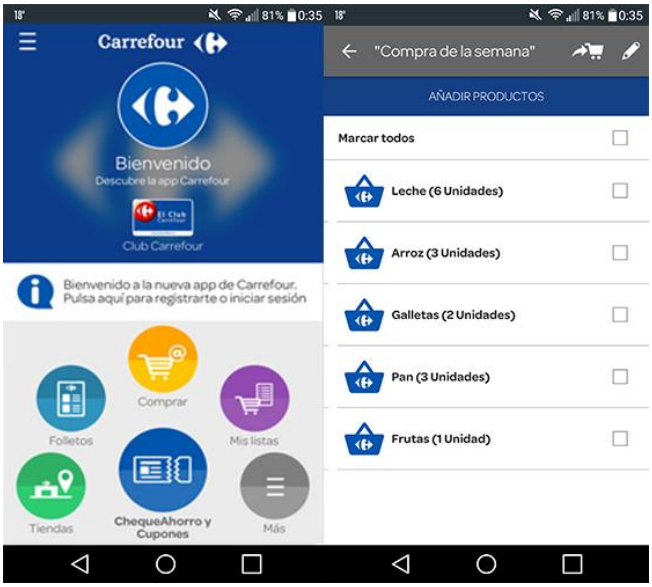

Figura 11 - Ejemplo de listas móviles

Fuente: Autor[6]

Informaciones móviles sobre productos (PR): son un tipo de servicio móvil que proporciona a los clientes información sobre productos y marcas (por ejemplo, ingredientes, potenciales desencadenantes de alergia, precio, etiquetas de calidad, fabricante o detalles sobre el proceso de fabricación) (véase figura 12). La información de producto disponible para los consumidores determina el valor que está asociado al producto (Stolzenbach, Bredie, Christensen, & Byrne, 2013). Además, diferentes estudios han probado que las propiedades no sensoriales, como la información sobre los productos y la publicidad, pueden influir en las expectativas que a su vez influyen en la respuesta de los consumidores hacia el producto, lo que conduce a la elección o el rechazo (Stolzenbach et al., 2013; Siegrist & Cousin, 2009; Siret & Issanchou, 2000; Deliza & McFie, 1996).

[6] Captura de pantalla realizada por el autor de la aplicación Mi Carrefour, disponible en Google Play. Accedido en mayo de 2017.

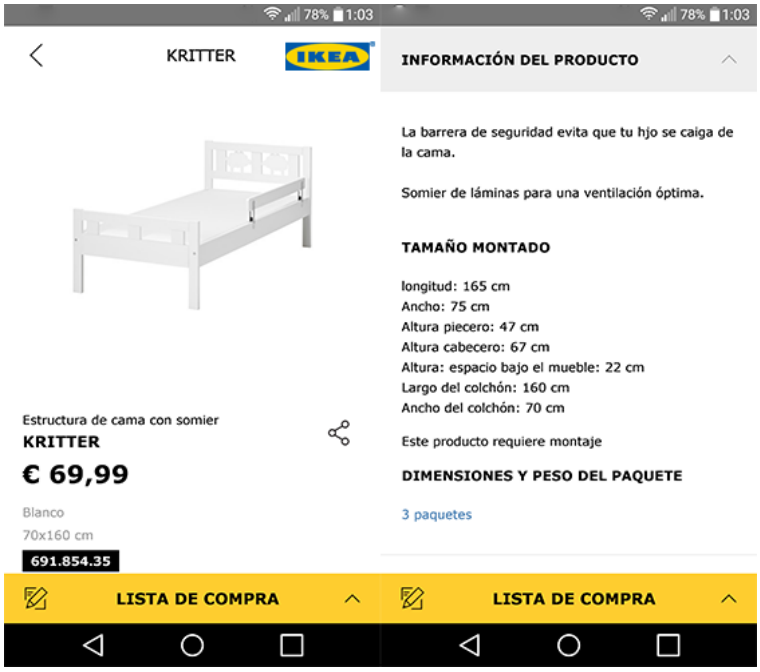

Figura 12 - Ejemplo de Información móvil sobre productos

Fuente: Autor[7]

Entretenimientos móviles (EN): Es cualquier tipo de actividad de ocio que interactúa con los proveedores de servicios, incluidos los servicios móviles para diversión y rifas. Ejemplos de este tipo de servicio móvil son los juegos, tonos de llamada, juegos de apuestas, acceso a servicios de entretenimiento basados en la localización, aplicaciones de comercio móvil como subastas, y navegación a través de Internet (véase figura 13) (Shchiglik & Scornavacca, 2004; Wiener, 2003; Wong & Hiew, 2005). Son servicios que permiten "matar el tiempo", siendo este el factor más importante que determina el uso de este tipo de servicios (Pousttchi & Goeke, 2011). Para los minoristas, este servicio tiene dos principios fundamentales: (1) debe prestar atención al diseño estético y, (2) en su caso, debe proporcionar aplicaciones que permitan retener al cliente mediante la "Gamification" en todos los tipos de aplicaciones móviles (Pousttchi & Hufenbach, 2014).

[7] Captura de pantalla realizada por el autor de la aplicación IKEA Store, disponible en Google Play. Accedido en mayo de 2017

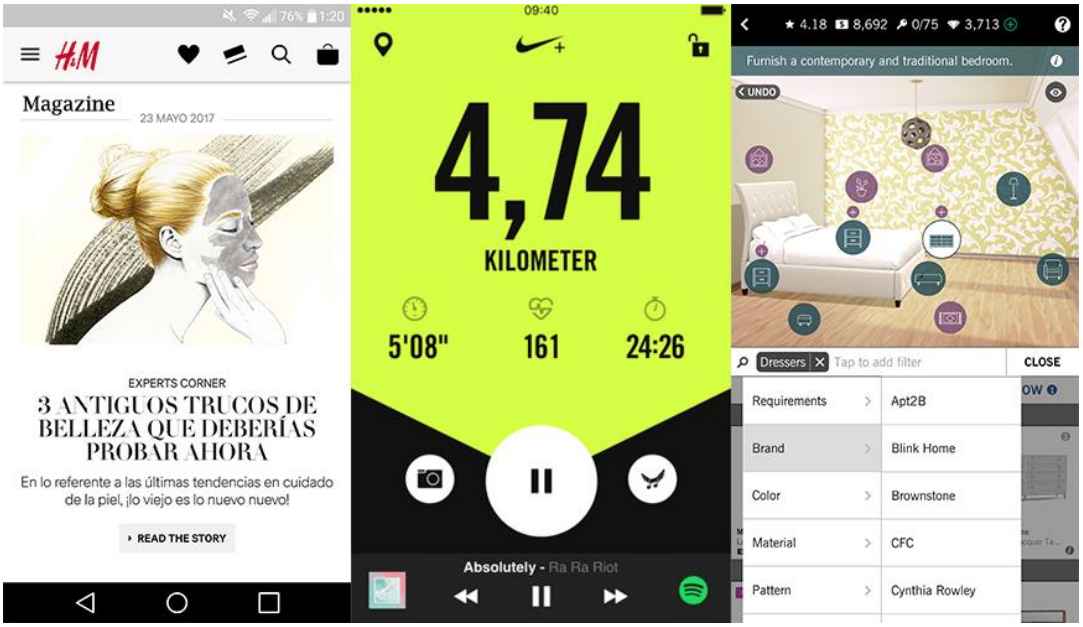

Figura 13 - Ejemplo de entretenimiento móvil

Fuente: Autor[8]

Redes sociales móviles (SM) se definen como cualquier plataforma "... que permita a las personas construir un perfil público o semipúblico, articular una lista de otros usuarios con los que tienen una conexión, y ver la lista de conexiones de éstos y las realizadas por otros dentro del sistema" (Boyd & Ellison, 2008). Las herramientas de medios sociales se han utilizado activamente para que las empresas presenten sus negocios en línea y alcancen valores de marketing (Stephen & Toubia, 2010). En estas plataformas los consumidores discuten, comentan y recomiendan productos/servicios. Basados en ello, las empresas los utilizan para desarrollar campañas de marketing a través del marketing viral móvil (Pousttchi & Hufenbach, 2014) (véase figura 14), permitiendo así que una determinada comunicación sea transmitida por los clientes a través de dispositivos móviles y de la red a otros clientes potenciales, lo que normalmente los alienta a continuar transmitiendo el contenido (Palka et al., 2009). Debido a la popularidad y el crecimiento de las herramientas de medios sociales, las empresas pueden interactuar activamente con los consumidores, lo que mejora las evaluaciones de los productos y conduce a decisiones de compra mejor informadas (Wang & Zhang, 2012). De este modo, el uso de los medios sociales pueden ser

[8] Captura de pantalla realizada por el autor de la aplicación H&M, Nike+ Run Club, Design Home, disponible en Google Play. Accedido en mayo de 2017

una buena estrategia para que las empresas aumenten sus ventas, manteniendo a los clientes actuales y desarrollando nuevos clientes (Lin, Li & Wang, 2017; Hajli, 2015).

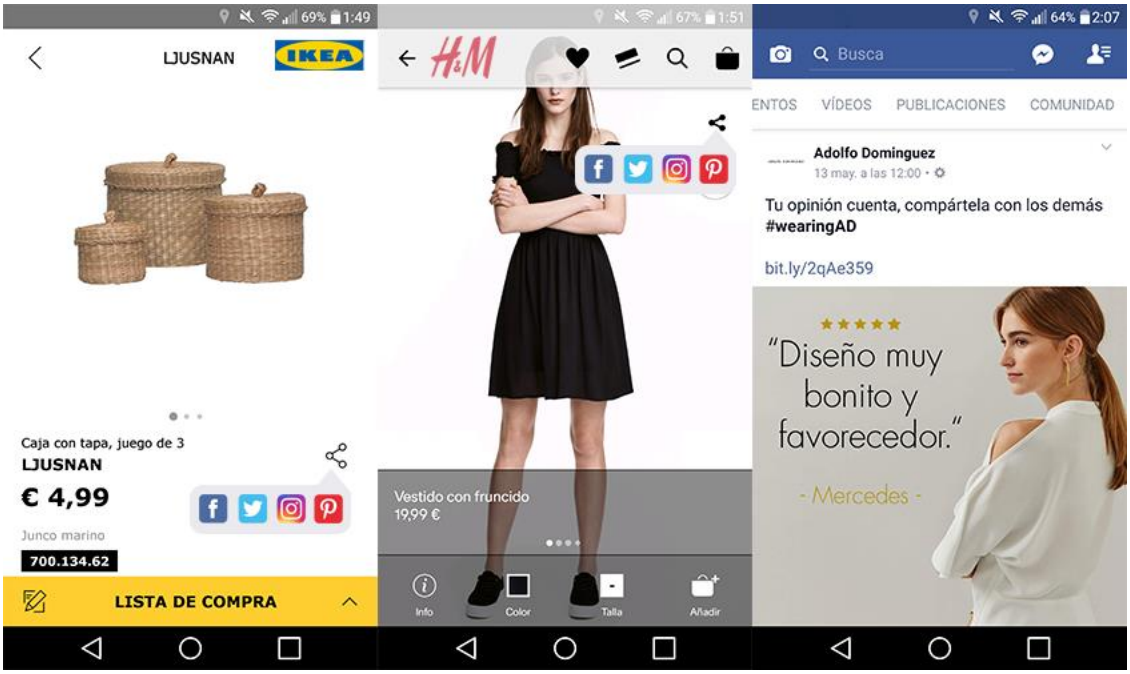

Figura 14 - Ejemplo de redes sociales móviles

Fuente: Autor[9]

Información personalizada (PI): Siguiendo a Pousttchi y Hufenbach, la PI "es percibida como valiosa por los clientes e incluso tienen el potencial de reenvío, que de nuevo genera información adicional sobre el reenvío y la recepción de los clientes (por ejemplo, identificar multiplicadores y líderes de opinión)." (Pousttchi & Hufenbach, 2014: 27). Basado en lo anterior, se han creado sistemas de información personalizados, que son sistemas de filtrado de la información que se esfuerzan por adaptar la funcionalidad de intercambio de información para los intereses específicos de sus usuarios (véase figura 15) (Parra-Arnau, Rebollo-Monedero, & Forné, 2014). Estos sistemas son cada vez más frecuentes en nuestro uso cotidiano, ya que está presente en una gran variedad de aplicaciones que utilizamos a diario en Internet, como por ejemplo al presentar los resultados de consultas realizadas a un buscador Web (Parra-Arnau *et al.*, 2014). Es a partir de las PI sobre lo que se fundamenta el marketing personalizado, un tipo de comunicación

[9] Captura de pantalla realizada por el autor de la aplicación IKEA Store, H&M y Facebook (Página oficial de Adolfo Domínguez), disponible en Google Play. Accedido en mayo de 2017.

específica basado en el historial de compra e interacción del cliente, en datos de opinión de los clientes (como preferencias, recomendaciones o clasificaciones) y en datos técnicos (como de la red, dispositivo, sistema operativo, navegador u otras aplicaciones) (Pousttchi & Hufenbach, 2014). La personalización, es una forma especial de diferenciación, y cuando se aplica en la fragmentación del mercado, puede transformar un producto o servicio estándar en una solución especializada para un individuo (Changchien, Lee, & Hsu, 2004). De esta manera, los comerciantes pueden buscar maneras de reunir informaciones de múltiples indicadores de evaluación de los clientes y analizar los comportamientos de compra de sus clientes mediante la utilización de técnicas de minería de datos y análisis estadístico para generar contenido y promociones personalizadas a sus clientes, ya que estas tienen el potencial de aumentar la tasa de éxito de la promoción, de la satisfacción y de la lealtad del cliente (Changchien et al., 2004).

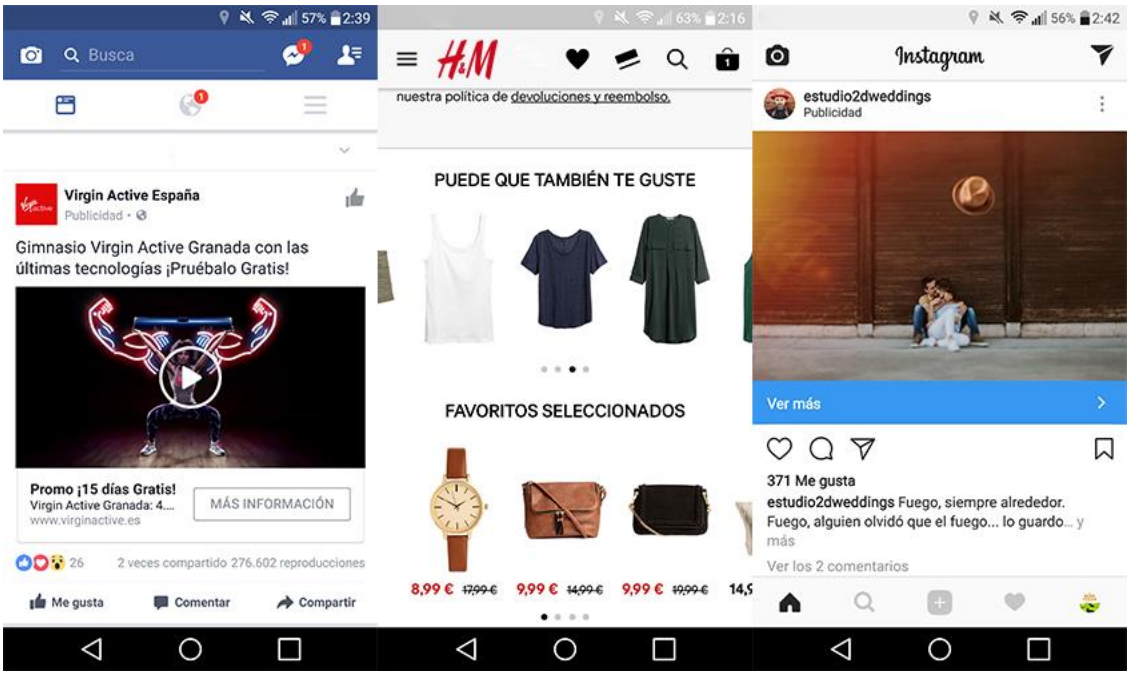

Figura 15 - Ejemplo de Información personalizada

Fuente: Autor[10]

Ticketing Móvil (TI): es el servicio que permite a los clientes ordenar, pagar, obtener y/o validar billetes a través de teléfonos móviles u otros dispositivos móviles (Pousttchi & Hufenbach,

[10] Captura de pantalla realizada por el autor de la aplicación Facebook, H&M y Instagram, disponible en Google Play. Accedido en mayo de 2017.

2014). Por billetes o *tickets* se entienden, entre otros, los documentos emitidos por parkings, transportes públicos, compañías aéreas, empresas de eventos, o comerciantes en general, y que permiten al cliente acceder a los servicios prestados por los mismos o por terceros, presentándose dicho documento en el móvil mediante una versión digital (véase figura 16). Entre las ventajas de los billetes móviles se incluyen: la utilidad, al incrementar la eficiencia genérica del proceso (Suki & Suki, 2017; Mallat *et al.*, 2009); la movilidad, al permitir el acceso a los lugares de servicio de una manera independiente, reduciendo las colas, y dando al cliente una opción alternativa a los métodos tradicionales (Mallat *et al.*, 2009). Entre sus beneficios también están la reducción de los costos de producción y distribución (en comparación con los canales tradicionales basados en papel), y un aumento en la comodidad del cliente proporcionando una manera sencilla de acceder a los servicios contratados. Para los comerciantes, este tipo de servicio puede ser integrado directamente en el proceso de pago para que los comerciantes puedan enviar a los clientes un billete de estacionamiento móvil o de transporte público gratuito, como una acción de marketing de bonificación, por ejemplo, por comprar en la tienda.

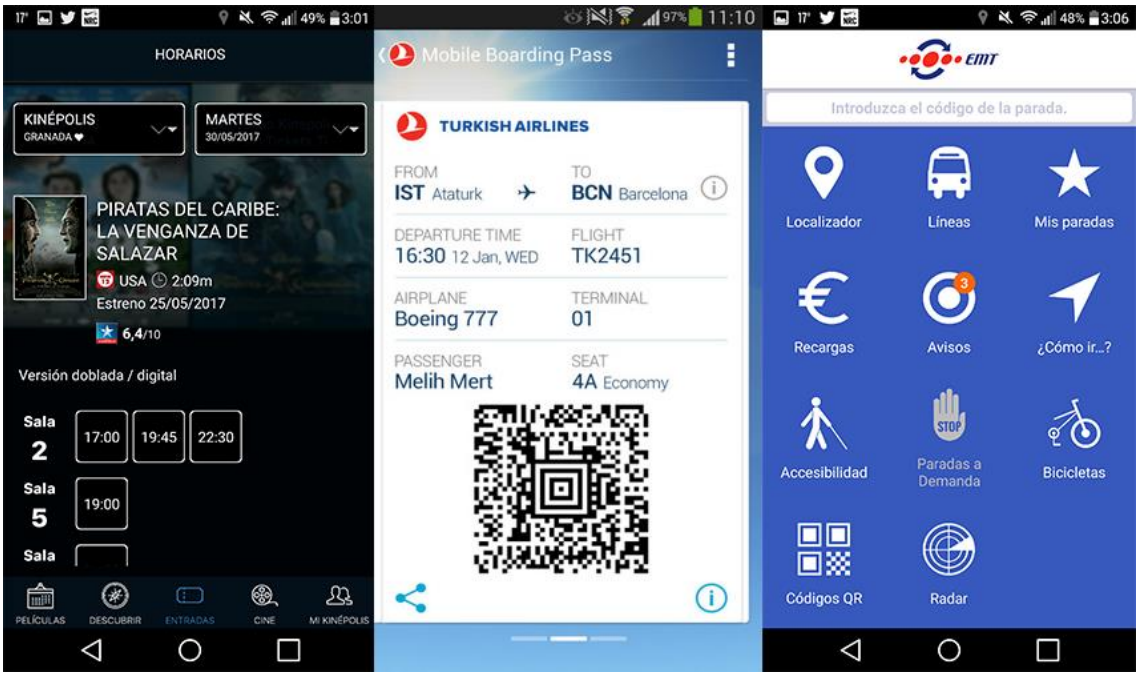

Figura 16 - Ejemplo de ticketing móvil

Fuente: Autor[11] y Turkish Airlines (2017)

[11] Capturas de pantalla realizada por el autor de las aplicaciones Kinépolis y EMT Málaga, disponible en Google Play. Accedido en mayo de 2017

Servicios basados en localización (LB): proporcionan al usuario información o servicios de valor añadido basados en la ubicación del usuario, gracias por las tecnologías de posicionamiento incorporadas en los dispositivos móviles (Ferreira & Ramos, 2014). Esto ha permitido la aparición de canales efectivos de comercio, que proporcionan ventajas tanto a empresas como a consumidores móviles (Kourouthanassis & Giaglis, 2012; Wyse, 2009). Los servicios de buscador de amigos y de seguimiento son sólo algunos de los servicios ya disponibles en la actualidad, como por ejemplo la aplicación Foursquare, Life 360 o Facebook (véase figura 17) que avisa cuando un amigo está cerca (Fodor & Brem, 2015), ya que, de hecho, si los individuos están dispuestos a revelar su ubicación es en gran medida influenciados por sus amigos (Chang & Chen, 2014). Los minoristas pueden utilizar esta herramienta para enviar, por ejemplo, cupones móviles o información personalizada a sus clientes cuando están cerca de su negocio. Este tipo de comercialización aumenta la probabilidad de compra (Drossos, Giaglis, Lekakos, Kokkinaki & Stavraki, 2007), y genera actitudes positivas hacia los anuncios (Beneke, Cumming, Stevens & Versfeld, 2010). Sin embargo, desde la perspectiva del consumidor, LB es un arma de doble filo, ya que permite aumentar los beneficios de personalización, pero también aumenta los riesgos de privacidad percibidos por los usuarios, lo que conducen a un dilema en la elección del consumidor (Sutanto et al., 2013; Guo et al, 2012.; Lee & Rha, 2016).

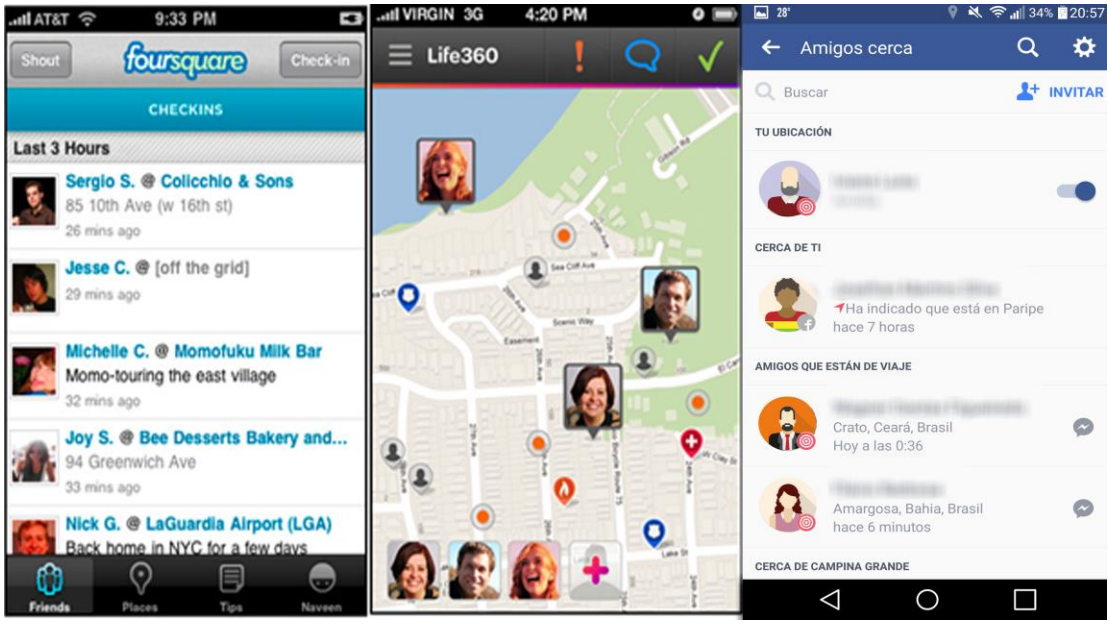

Figura 17 - Ejemplo de Servicios basados en localización

Fuente: Olaya (2014) y Autor[12]

Evaluaciones móviles (RA) son evaluaciones subjetivas de productos o servicios realizadas por clientes a través de dispositivos móviles (véase figura 18). Diversos sitios web de comercio electrónico y sitios web de opiniones de productos/servicios (Amazon, Ebay, Gearbest, Aliexpress, etc.) permiten a los usuarios compartir opiniones sobre un producto/servicio, al proporcionar comentarios de texto, que normalmente lleva asociada una calificación numérica o por estrellas (Cosma & Acampora, 2016; Pousttchi & Hufenbach, 2014). Estas opiniones influyen en gran medida en las futuras decisiones de compra de los consumidores, debido a que muchos consumidores tienen en cuenta los comentarios como un recurso fiable al momento de decidir si comprar un producto (Cosma & Acampora, 2016). Por esta razón, es importante que, en base a las evaluaciones, los minoristas interactúen con los clientes, analizando la calidad del servicio y mejorando los servicios y productos, para que sirvan como referencia positiva para futura compras.

[12] Capturas de pantalla y edición realizada por el autor de la aplicación Facebook, disponible en Google Play. Accedido en mayo de 2017

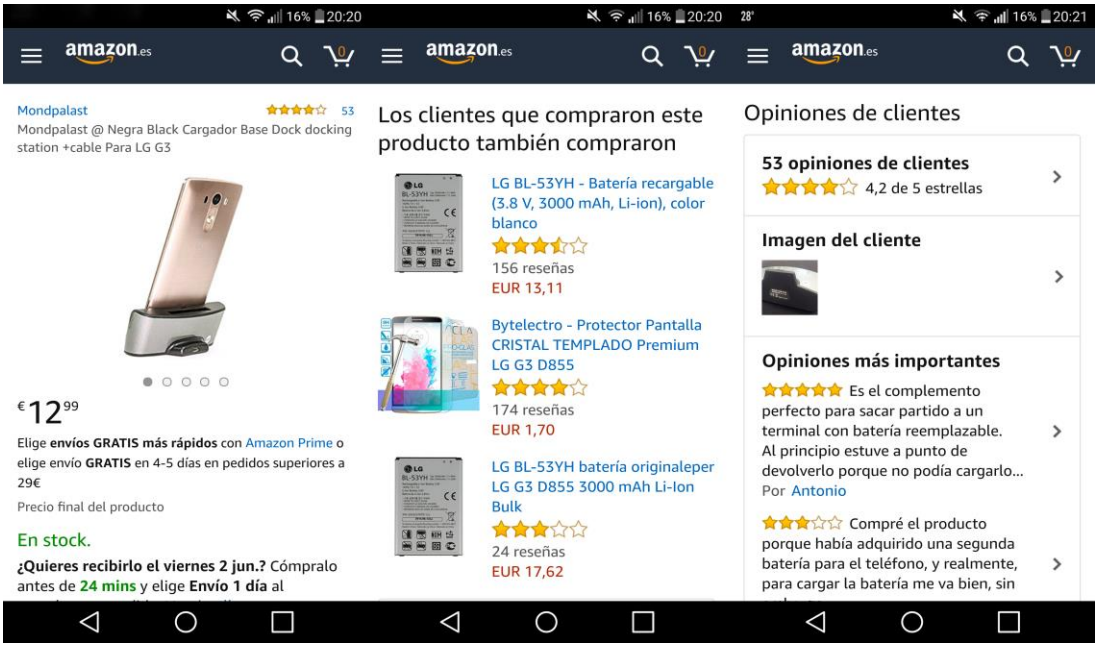

Figura 18 - Ejemplos de Evaluaciones móviles

Fuente: Autor[13]

Programas de fidelización (LO) son un tipo de herramienta de marketing diseñada para fidelizar a los clientes a través de un plan de recompensas planificado, generalmente basado en el historial de compras del cliente (Bolton, Kannan & Bramlett, 2000; Uncles, Dowling, & Hammond, 2003). Los programas de fidelización aumentan los beneficios operacionales evitando la competencia de precios y también aumentan la lealtad del cliente hacia la marca (Kim, Shi, & Srinivasan, 2001). Este tipo de servicio genera implicaciones cognitivas, generando una respuesta de comportamiento positiva y aumentaando la confianza del cliente mediante el desarrollo de un vínculo emocional entre empresa y consumidor (Butscher, 2002). El objetivo de estos programas es generalmente retener a un nivel más alto de consumidores en sectores rentables generando un mayor sentido de satisfacción y valor (Bolton, et al., 2000). Un gran número de minoristas hacen uso de este tipo de programas (por ejemplo, Doblecero de El Corte Inglés, El club Carrefour, o Starbucks Rewards) que ofrecen recompensas a los compradores frecuentes, tales como puntos rescatables con descuentos para futuras compras (véase figura 19). Con el avance de las tecnologías de minería de datos y el creciente interés por el análisis de datos, se espera que los programas de

[13] Capturas de pantalla realizada por el autor de la aplicación Amazon Compras, disponible en Google Play. Accedido en mayo de 2017

lealtad ganen más valor, por ofrecer la oportunidad de recoger una gran variedad de datos de los clientes y de sus relaciones con la marca/empresa. A modo de ejemplo la empresa Target ha combinado con éxito los datos de su programa de fidelización con sus capacidades de minería de datos. Los datos recogidos a través de su programa de fidelización, RedCard, permiten a Target proporcionar ofertas personalizadas a sus consumidores de mayor valor mediante el análisis de sus historiales de transacciones a nivel individual de cliente (Lim & Lee, 2015). De este modo, todo su potencial puede ser obtenido integrando este tipo de servicio en una aplicación de pago móvil, y permitiendo a los comercios conocer, clasificar y ofrecer a sus clientes oportunidades de disfrutar de beneficios exclusivos.

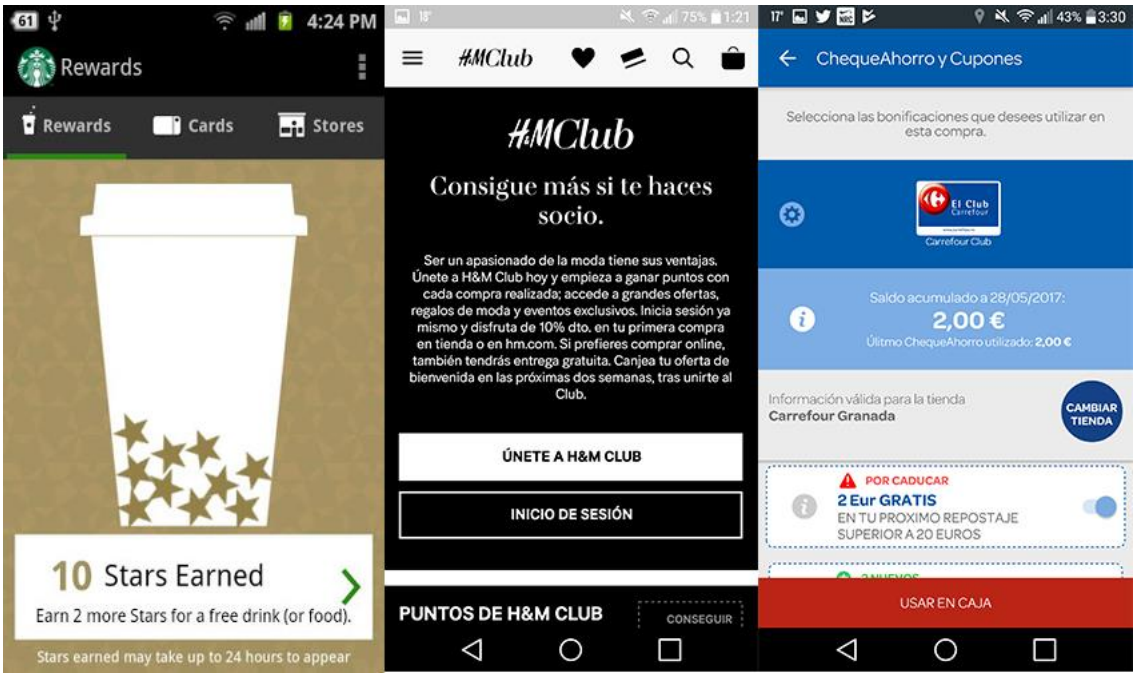

Figura 19 - Ejemplo de programas de fidelización móvil
Fuente: Girish (2014) y Autor[14]

Operadores de redes virtuales móviles (MVNO) son empresas que venden servicios de comunicaciones móviles (voz o datos) bajo su marca sin poseer su propia licencia de red móvil (Pousttchi y Hufenbach, 2009) (véase figura 20). Aunque prácticamente todas las operaciones

[14] Capturas de pantalla realizada por el autor de la aplicación H&M y Mi Carrefour, disponible en Google Play. Accedido en mayo de 2017

realizadas por el MVNO son no estratégicas y tratan los servicios móviles como cualquier otro producto de marca comercial, estos tienen un potencial estratégico muy alto por poseer datos de acceso de los clientes a la red móvil. Dependiendo del tipo de MVNO, pueden tener una facturación directa y relaciones estables con los clientes, alcanzando por lo tanto una gran base de clientes (incluyendo números de teléfono móvil y control parcial del dispositivo) para una variedad de servicios móviles de minoristas (Pousttchi & Hufenbach, 2014).

Figura 20 - Ejemplos de MVNO en Alemania, España y Brasil
Fuente: Basado en Telecomvibe[15], Telcominterlex[16] y Teleco (2017)

Este último servicio (MVNO) no se incluyó en la investigación presentada en esta tesis doctoral porque nuestro estudio se centra en los servicios móviles ofrecidos por los minoristas integrados en el pago móvil, y en el momento actual este tipo de servicio es todavía muy poco relacionado con este método de pago.

Cada vez en mayor medida las empresas se adhieren a estos servicios como medios de marketing móvil y de generar datos para dirigir decisiones comerciales. La mayoría ofrece servicios móviles combinados en una única aplicación móvil.

El atractivo de todos estos servicios, desde la perspectiva integral que proporciona esta tesis doctoral, es su papel como potencial motivador para incrementar el uso del pago móvil. Podría ser

[15] http://telecomvibe.com/wp-content/uploads/2015/02/Germ_mvno-copy.png, acceso en mayo de 2017.
[16] https://telcominterlex.files.wordpress.com/2011/03/hidden_264_10446_foto_operadoras.jpg, acceso en mayo de 2017.

más conveniente tanto para clientes como para empresa que estos servicios en vez de ser lanzados de manera independiente, pudieran ser integrados a una herramienta de pago móvil, creando así una plataforma de servicios móviles integrados donde se les permita a los comercios realizar prácticas de marketing móvil en un único canal.

3.3 El valor de los servicios móviles para los consumidores

Además de los beneficios inherentes a los servicios mencionados, el valor adicional creado por los servicios móviles para los consumidores se deriva de que estos servicios son accesibles independientemente del tiempo y del lugar (Balasubramanian, Peterson, & Jarvenpaa, 2002; Chen & Nath, 2004), y de la personalización basada en el tiempo, la ubicación y el perfil personal (Figge, 2004). De esta forma, el factor impulsor del uso de las tecnologías móviles por los comercios es la interacción entre clientes y empresas que ofrece dichos servicios, junto con el aumento de la eficiencia operativa del minorista (Kumar & Zahn, 2003).

El marketing móvil puede servir como una herramienta para involucrar a los consumidores en actividades de co-creación de valor, independientemente del tiempo y del lugar, haciendo que el valor generado por los consumidores impulse aún más la adopción, el uso y la lealtad a las aplicaciones de marketing móvil de los minoristas, colaborando de este modo en un aumento de nuevos clientes y de la lealtad hacia la empresa (Ström *et al.*, 2014).

Por otro lado, la posibilidad de asociar el perfil de los consumidores con el uso de funcionalidades adicionales en el proceso de compra como las que se han descrito en este capítulo, permite la realización de comportamientos diferenciados por parte de los consumidores individuales. Es importante que estos comportamientos diferenciales sean explotados, ya que el objetivo de la integración de estos servicios es también proporcionar al cliente una experiencia más satisfactoria. De este modo, es fundamental conocer los diferentes tipos de consumidores y sus preferencias frente a nuevos sistemas para la adopción del pago móvil.

Al considerar el proceso de difusión de tecnología, hay ciertos segmentos de la población que son más propensos a probar dicha tecnología antes que otros (Rogers, 2003). De esta forma se pueden identificar cinco categorías de adoptantes: innovadores (2,5%), adoptantes tempranos (13,5%), mayoría temprana (34%), tardía (34%) y rezagados (16%).

Aunque existen pocos estudios sobre la influencia de la innovación personal en la intención de utilizar las innovaciones tecnológicas, creemos que es importante profundizar el conocimiento

en esta área y comprender mejor el papel que este factor juega en la adopción del pago móvil, especialmente en el marco de los servicios móviles adicionales a este tipo de pago.

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CHAPTER 3

INTEGRATION OF ADDITIONAL SERVICES AND MOBILE PAYMENTS DEVELOPMENT

This chapter contextualizes and classifies the different mobile services. It also describes concepts associated with mobile marketing and discusses the relevance of mobile services for the development of mobile payments from the perspectives of business and marketing. This chapter therefore allows the reader to explore how mobile marketing can generate value for both the client and business and in this framework advance new means to create strategies to increase the adoption of mobile payment in the coming years.

3.1 Conceptualization of mobile marketing

The growth in the adoption of mobile devices and the increase of mobile application use is not limited exclusively to offering opportunities to technology companies, but also offers retailers the opportunity to exploit a new channel to interact with customers. These devices offer the possibility to combine the functionality of the phone with the search of information, payments, and interaction with the customer before, during and after purchase. This even includes when the client is inside a store buying or choosing what to buy. A mobile device is a constant companion for the consumer, a gateway to a relationship between consumer and merchant, amounting to an ideal additional channel for distance sales and physical retail (Shankar, Venkatesh, Hofacker, & Naik, 2010).

Mobile devices have even more potential as their relationship with the consumer is even closer and continual. It is therefore an important means for business as it offers the opportunity to generate value for the customer through the offer of interesting additional services that integrate marketing strategies capable of enhancing the business-client relation.

This potential has given way to the development of so-called “mobile marketing.” According to the *Mobile Marketing Association,* Mobile marketing is defined as "... a set of practices that enables organizations to communicate and engage with their audience in an interactive and relevant manner through any mobile device or network."[17]

The impressive potential of the mobile marketing market is evident based on the fact that, based on findings of the year 2015, the global industry will expand at a annual growth rate of 28.1%, reaching 98.85 billion dollars in 2021.[18]

These figures are the result of the increasing penetration of mobile devices among the population and the various advantages provided by mobile marketing. The literature review by Ström et al. (2014) found that mobile marketing offers the following advantages to retailers: (1) it is a more effective channel than traditional media as it offers sales promotion and direct marketing for brands and sales communication; (2) it offers opportunities to optimize, customize, and improve in-store shopping experiences, product usage and other post-purchase interactions leading to a service experience that can attain new levels of perceived values and satisfaction. These new levels of "customer delight" can contribute to brand image, fostering loyalty and an increase of consumer

[17] http://www.mmaglobal.com/wiki/mobile-marketing (accessed May, 2017)
[18] http://www.marketsandmarkets.com/PressReleases/mobile-marketing.asp (accessed May, 2017).

recruitment; (3) increases the value of existing marketing investments by adding interactivity to existing brand touchpoints, improving the processing of consumer information resulting in improved brand effects; (4) the potential of these benefits to be more durable is increasing, as the structural links and the development of the network of partners supporting these advantages is being optimized over time.

On the other hand, maximizing the potential of this form of commercial communication requires optimizing the inherent attributes of mobile marketing such as personalization, ubiquity, interactivity and localization (Bauer, Reichardt, Barnes, & Neumann, 2005). This requires the development of an effective mobile marketing program which is much more complex and difficult to create than traditional methods of digital marketing.

Those responsible for the development of a mobile marketing program should be care to plan, implement and test the system for multiple devices (smartphones, tablets, laptops, desktops, etc ...) and different operating systems, so that the system adjust to the particularities of all devices. They should also consider that the immediacy, location, and personalization characteristics of mobile devices increase the need to develop a system that reflects attributes such as distance to a store (location), or history of purchase behavior (personalization). Finally, they must receive cooperation from retailers to install and update the content they intend to spread (Berman, 2016).

Despite the difficulties, a correct implementation of mobile marketing is an important base for achieving a sustainable competitive advantage as it contributes to the improvement of the consumer experience towards the brand and reinforces or adds value for the customer (Störm et al., 2014).

On the other hand, although the mobile payments ecosystem is maturing, the industry faces problems in getting both business and consumers to adopt mobile payments to the point of making it a mass-use payment method. This difficulty exists in spite of the method offers benefits to both parties: enhanced security features, faster shopping, and possibility of integration services marketing.

From a business perspective, an integration of mobile marketing with mobile payment systems can represent a great opportunity for gathering useful information about buyer behavior and consumption based on evidence of purchase (Pousttchi & Hufenbach, 2013). With the data generated the possibilities are diverse, and physical store business have a great opportunity to know their customers and their preferences, allowing them to carry out analyses of customer profile,

values, and acquisition efforts so as to compete on equal terms with online businesses (Kotler, 1994; Labe, 1994).

3.2 Classification of mobile services

Mobile services are innovative and interesting tools both for retailers and customers. Yet their prevalence depends to a large extent on technological improvements and usability, as well as user adoption. Therefore, the success of any electronic offer is not the inevitable consequence of its mere existence, and that is why the adoption of mobile services faces multiple barriers (Gebauer, Shaw, & Gribbins, 2010). To achieve the success, users need to specifically recognize the benefits of these technologies over conventional methods (Pousttchi, Turowski, & Weizmann, 2003).

Studies regarding mobile commerce suggest that there is an interest among consumers in specific mobile services: mobile tickets for public transport (Di Pietro, Mugion, Mattia, Renzi & Toni, 2015), mobile parking tickets (Mallat, Rossi, Tuunainen, & Öörni, 2009), social networks (Liébana-Cabanillas, Herrera & Guillén, 2016), personal information and personalized marketing (Eastin, Brinson, Doorey, & Wilcox, 2016), loyalty programs (Lim & Lee, 2015), geolocation services Lee & Rha, 2015), mobile coupons (Khajehzadeh, Oppewal, & Tojib, 2014), mobile marketing (Ström, Vendel, & Bredican, 2014), etc.

Furthermore, Pousttchi & Hufenbach (2014) have analyzed the mobile commerce services and have identified 12 categories of mobile services labelled *Building Blocks* (BB). The BBs include mobile payments and 11 other mobile services (Pousttchi & Hufenbach, 2014) illustrated in Figure 9:

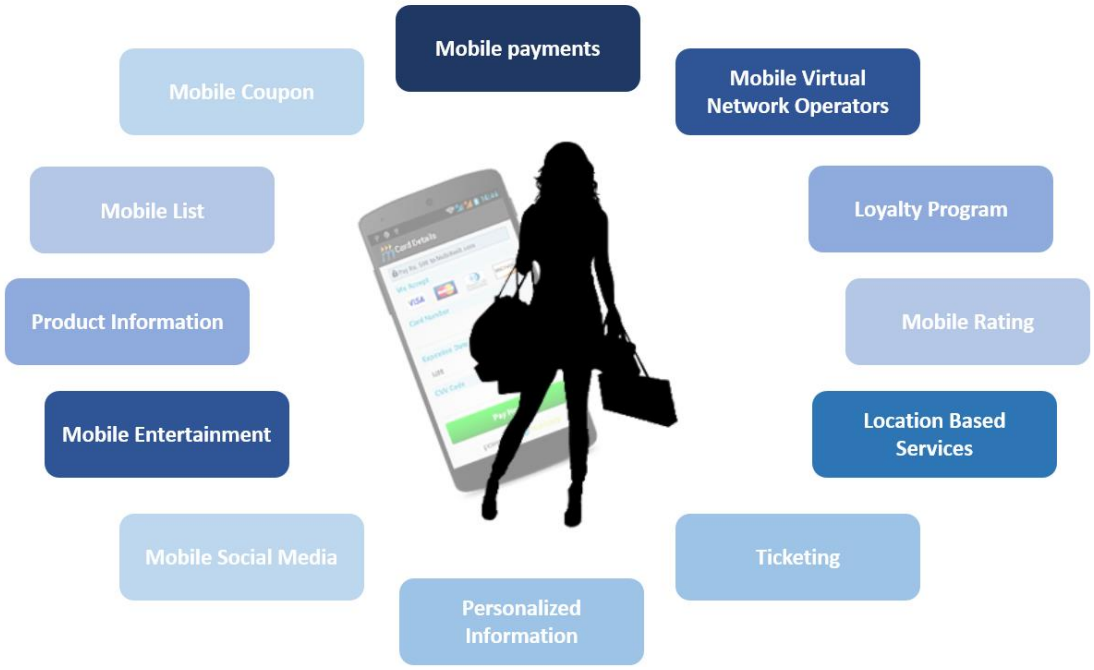

Figure 9 - Additional mobile services

Source: Author (from Pousttchi & Hufenbach, 2014)

Mobile Coupons (CO) are a type of digital coupon that businesses can send consumers as an incentive to buy in a particular store. They also serve to improve relations between the business and the consumer, creating new sales and recommendations (Grewal et al., 2011; Pousttchi & Hufenbach, 2014). This includes the process of sending, reception, forwarding and exchanging a digital coupon for mobile devices. Mobile coupons are primarily aimed at increasing sales through price reductions offered in the form of money-saving coupons, compliments, or other values (Dickinger & Kleijnen, 2008). The low cost of generating and delivering these coupons facilitates their massive distribution (Friedrich, Gröne, Hölbling, & Peterson, 2009). This type of service can also be used in integrated marketing campaigns to complement other marketing measures (Batra & Keller, 2016). McDonald's, Carrefour, Burger King and Levi's are some of the well-known companies that use the mobile coupon as a mobile marketing strategy (see Figure 10).

Figure 10 - Example of mobile coupons

Source: author[19]

Mobile Lists (SL) consists of all types of lists that can be generated by customers through mobile devices such as wish, gift, product, or shopping lists in general (see Figure 11). The written list includes specific assistance for memory (Block and Morwitz, 1999) that encodes the buying intentions of consumers (Spiggle, 1987). Mobile lists can provide information on consumer purchase intent associated with a buyer profile. For this they are considered pre-planned behavior purchase tools (Schmidt, 2012). Therefore, these lists are interesting tools to improve sales as they revert to data about customer requirements and send recommendations for cross-sales and up-sales, offering discounts, or even promotional gifts based on the items listed as an incentive purchase.

[19] Screenshot by author from: Mc Donalds España, Cuponeria Cupones y Ofertas, Mi Carrefour, Burguer King® España applications, accessible on Google Play. (accessed May, 2017)

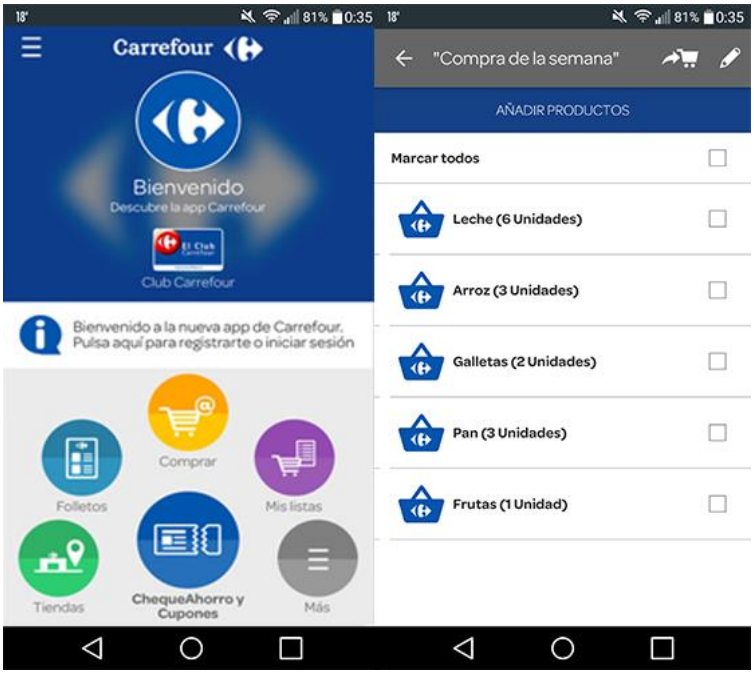

Figure 11 - Example of mobile lists

Source: Author[20]

Mobile product information (PR): is a type of mobile service that provides customers information about products and brands (e.g. ingredients, potential triggers of allergies, price, quality labels, manufacturer or details of the manufacturing process) (see Figure 12). The product information available to consumers about a product determines its associated value (Stolzenbach, Bredie, Christensen, & Byrne, 2013). In addition, different studies reveal that non-sensory properties such as product information and advertising can influence expectations that in turn influence consumer response to the product leading to acceptance or rejection (Stolzenbach et al., 2013; Siegrist & Cousin, 2009; Siret & Issanchou, 2000; Deliza & McFie, 1996)

[20] Screenshot by author of the Mi Carrefour application, accessible on Google Play. (accessed May, 2017)

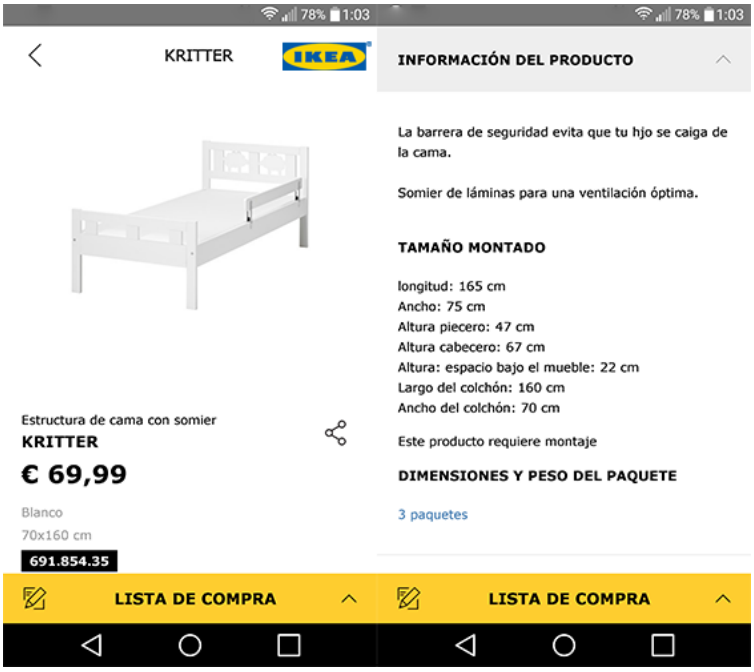

Figure 12 - Example of mobile product information

Source: Author[21]

Mobile entertainment (EN): is any kind of leisure activity that interacts with service providers, including mobile services for fun and raffles. Examples of these mobile services are games, ringtones, betting games, access to location-based entertainment services, mobile businnes applications such as auctions, and Internet browsing (see Figure 13) (Shchiglik & Scornavacca, 2004; Wiener, 2003; Wong & Hiew, 2005). These most important factor of these services is that they offer the potential to “kill time” (Pousttchi & Goeke, 2011). For retailers, this type of service has two fundamental principles: (1) it must pay attention to the aesthetic design and when appropriate, (2) provide applications that retain the client by means of "Gamification" in all types of mobile applications (Pousttchi & Hufenbach, 2014).

[21] Screenshot by author of the IKEA Store applications available on Google Play. (accessed May, 2017).

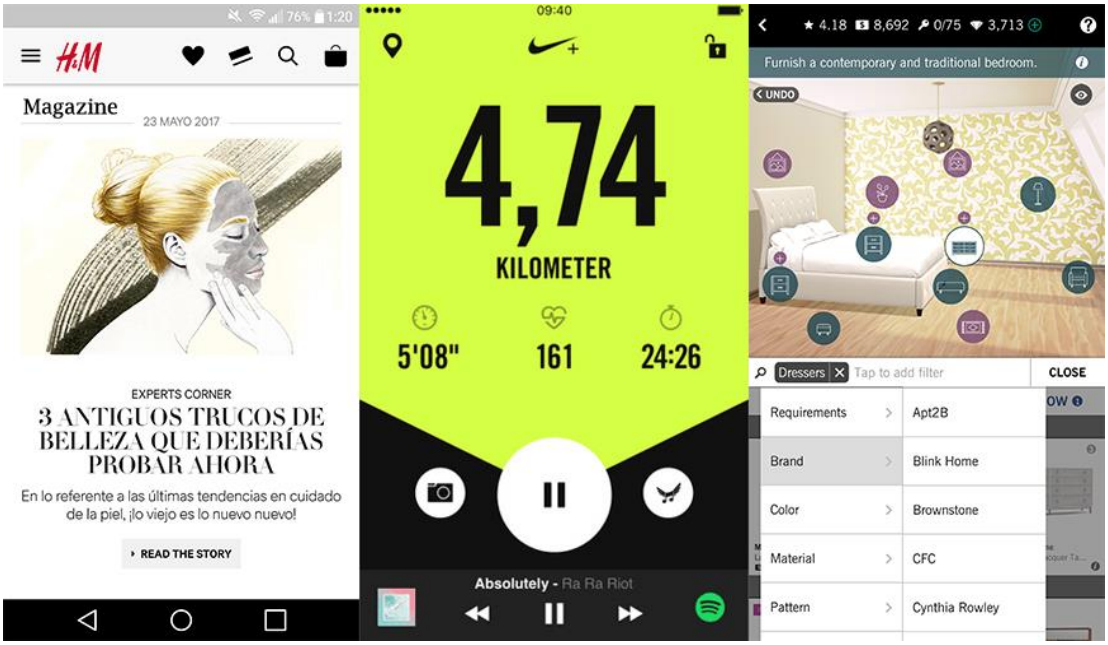

Figure 13 - Example of mobile entertainment services

Source: Author[22]

Mobile Social Networks (SM): is defined as any platform that allows people to construct a public or semi-public profile, articulate a list of other connected users, and see the list of connections of others in the system (Boyd & Ellison, 2008). Social media tools are actively used by companies to present online business and achieve marketing values (Stephen & Toubia, 2010). These offer consumers' platforms to discuss, comment and recommend products/services. Based on this, companies use them to develop marketing campaigns through mobile viral marketing (Pousttchi & Hufenbach, 2014) (see Figure 14) allowing a specific communication to be transmitted by customers through mobile devices and mobile devices. The network to other potential customers which usually encourages them to continue transmitting the content (Palka et al., 2009). Due to the popularity and growth of social media tools, companies can actively interact with consumers. This improves product evaluations and leads to more informed purchasing decisions (Wang & Zhang, 2012). Hence the use of social media is a positive strategy for companies to increase their sales, retain current customers while developing new clients (Lin, Li & Wang, 2017; Hajli, 2015).

[22] Screenshot by author of the H&M, Nike+ Run Club and Design Home applications available on Google Play. (accessed May, 2017).

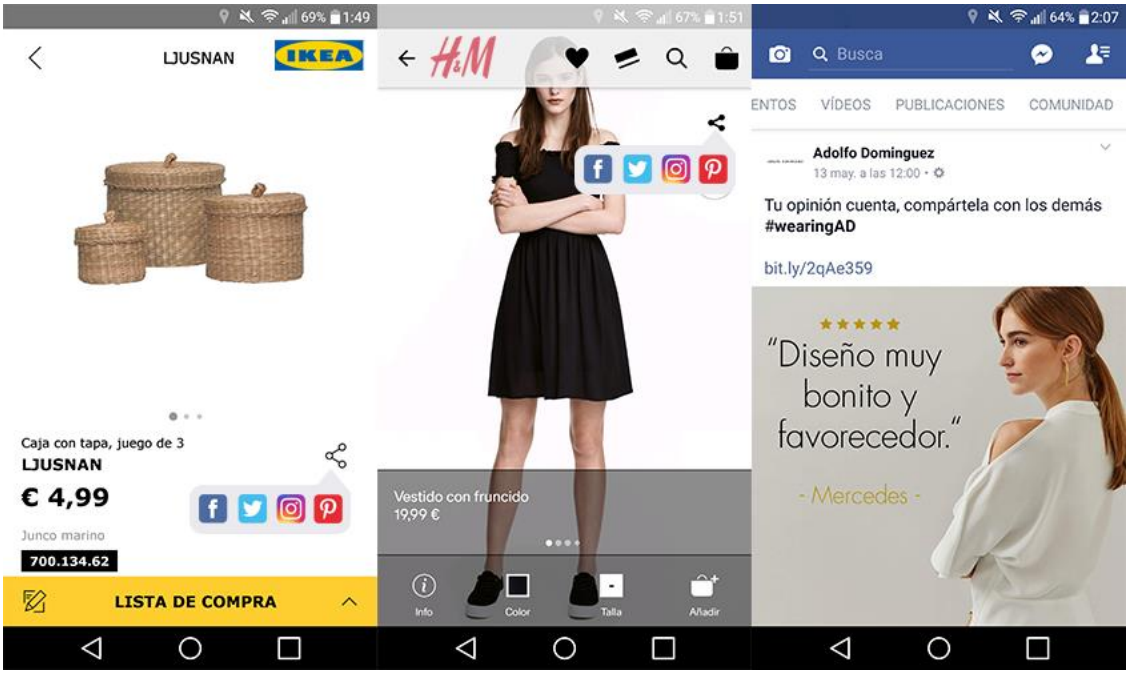

Figure 14 - Example of mobile social networks

Souce: Author[23]

Personalized information (PI): Following Pousttchi and Hufenbach, PI "is perceived as valuable by customers and even has the potential for forwarding, which again generates additional information about forwarding and receiving customers (e.g., identifying multipliers and opinion leaders)." (Pousttchi & Hufenbach, 2014: 27). Custom information systems were developed based on the above that comprise information filtering systems that strive to adapt information sharing functionality to the specific interests of their users (see Figure 15) (Parra-Arnau, Rebollo-Monedero, & Forné, 2014). These systems are increasingly more frequent in everyday use since they are present in a variety of applications of daily Internet. An example is presenting the results of consultations on a Web browser (Parra-Arnau *et al.*, 2014). Personalized marketing is based on PI. It is a specific type of communication based on purchase history and customer interaction, data from customer feedback (such as preferences, recommendations or ratings) and technical data (such as network, device, operating system, browser or other applications) (Pousttchi & Hufenbach, 2014). Personalization is a special form of differentiation that when applied to market

[23] Screenshot by author of Facebook, H&M and Facebook (official website of Adolfo Domínguez) applications available on Google Play. (accessed May, 2017)

fragmentation can transform a standard product or service into a specialized solution for an individual (Changchien, Lee, & Hsu, 2004). Therefore, traders can look for ways to gather information from multiple indicators of client assessment and analyze the purchasing behavior of their clients by applying techniques of data mining and statistical analysis to generate content and customized promotions as clientes have the potential to increase the success rate of promotion, satisfaction and customer loyalty (Changchien et al., 2004).

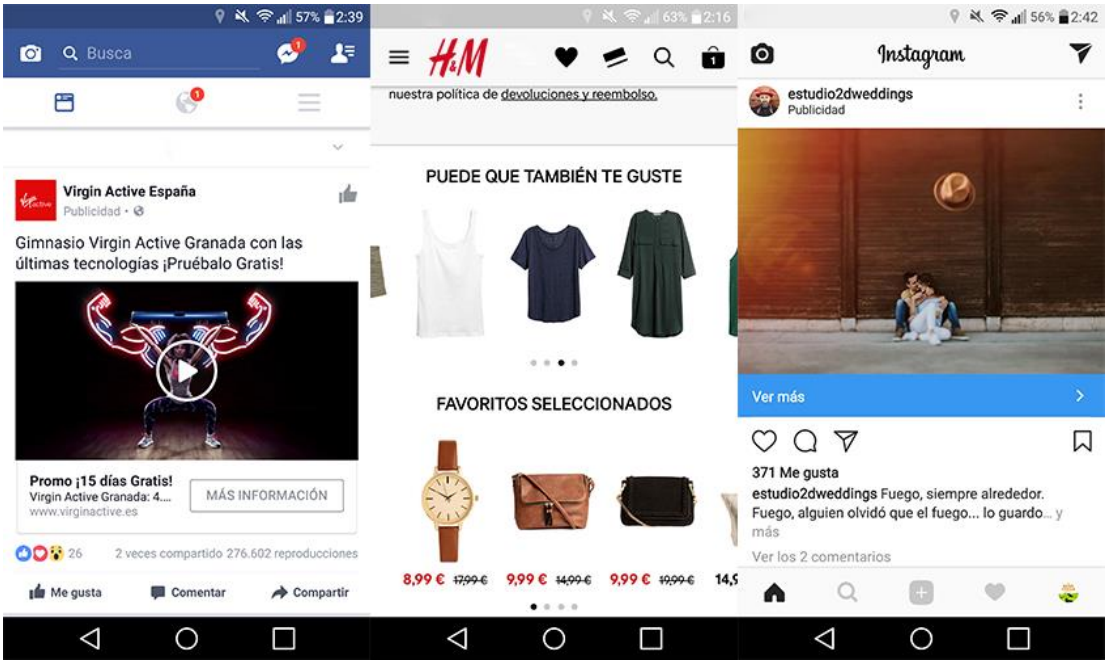

Figure 15 - Example of personalized information

Source: Author[24]

Mobile **Ticketing** (TI): is a service that allows clients to order, pay, obtain and/or validate tickets through mobile phones or other mobile devices (Pousttchi & Hufenbach, 2014). They are issued by parking lots, public transport, airlines, event companies or other types businesses in general. They allow customers to access the services provided by them or by third parties by presenting the documents in a digital version (see Figure XF). The advantages of the mobile tickets system are the following: utility resulting from increasing their generic efficiency process (Suki & Suki, 2017; Mallat *et al*., 2009); mobility, allowing independent access to places of service

[24] Screenshot by author of Facebook, H&M and Instagram applications available on Google Play. (accessed May, 2017)

reducing queues and offering customers an alternative option to traditional methods (Mallat *et al.,* 2009). Among its benefits are also reducing of production and distribution costs (as opposed to traditional paper-based channels) and increasing customer convenience by providing a simple access to services. This type of service for business can be integrated directly into the payment process so that businesses can offer customers a free mobile parking or public transport ticket as a bonus marketing action, for example, for purchasing in their store.

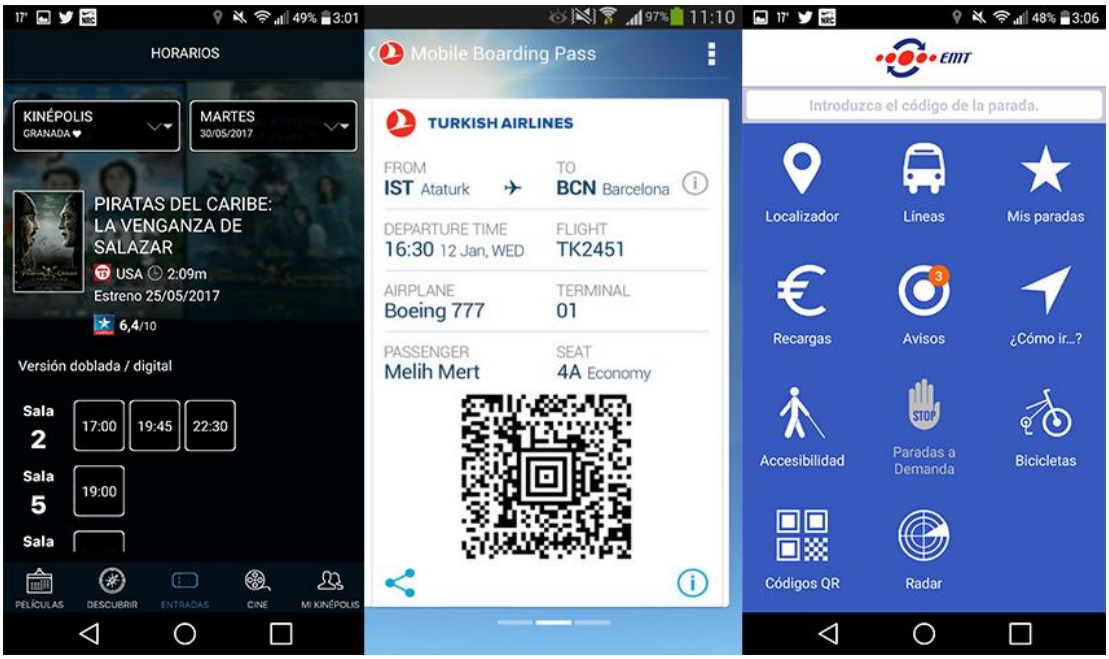

Figure 16 - Example of mobile ticketing

Source: Author[25] and Turkish Airlines (2017)

Location-based services (LB)**:** provide the user with information or value-added services based on the user's location, as a result of positioning technologies incorporated in mobile devices (Ferreira & Ramos, 2014). This service gives rise to the emergence of effective business channels that provide advantages to both mobile companies and consumers (Kourouthanassis & Giaglis, 2012; Wyse, 2009). Search and tracking of friends are just some of the services already available toda, such as the Foursquare, Life 360 or Facebook applications (see Figure XG) that alerts you when a friend is nearby (Fodor & Brem, 2015) since, in fact, if individuals are willing to disclose their location, it is largely due to the influence of friends (Chang & Chen, 2014). Retailers can use

[25] Screenshot by author of Kinépolis and EMT Málaga applications available on Google Play. (accessed May, 2017).

this tool to send, for example, mobile coupons or personalized information to their customers when they are near their business. This type of marketing increases the likelihood of purchase (Drossos, Giaglis, Lekakos, Kokkinaki & Stavraki, 2007) and generates positive attitudes toward advertisements (Beneke, Cumming, Stevens & Versfeld, 2010). However, from a consumer perspective, LB is a double-edged sword because it increases the benefits of customization while simultaneously increases privacy risk among the perception of users (Sutanto et al., 2013; Guo et al., 2012.; Lee & Rha, 2016).

Figure 17 - Example of Location-based services

Source: Olaya (2014) and author[26]

Mobile Rating (RA): are subjective evaluations of products or services by customers through mobile devices (see Figure XI). Several e-commerce websites and product/service review websites (Amazon, Ebay, Gearbest, Aliexpress, etc.) allow users to share opinions about a product/service by providing text comments which are usually associated with a numerical or star rating (Cosma & Acampora, 2016; Pousttchi & Hufenbach, 2014). These opinions bear a great influence on future consumer purchasing decisions since many clients consider comments as a reliable resource when deciding whether to acquire a product (Cosma & Acampora, 2016). It is therefore important that retailers, based on these evaluations, interact with customers and analyze

[26]Screenshot by author of Facebook applications available on Google Play. (accessed May, 2017).

service quality and improve services and products as they serve as a positive reference for future purchases.

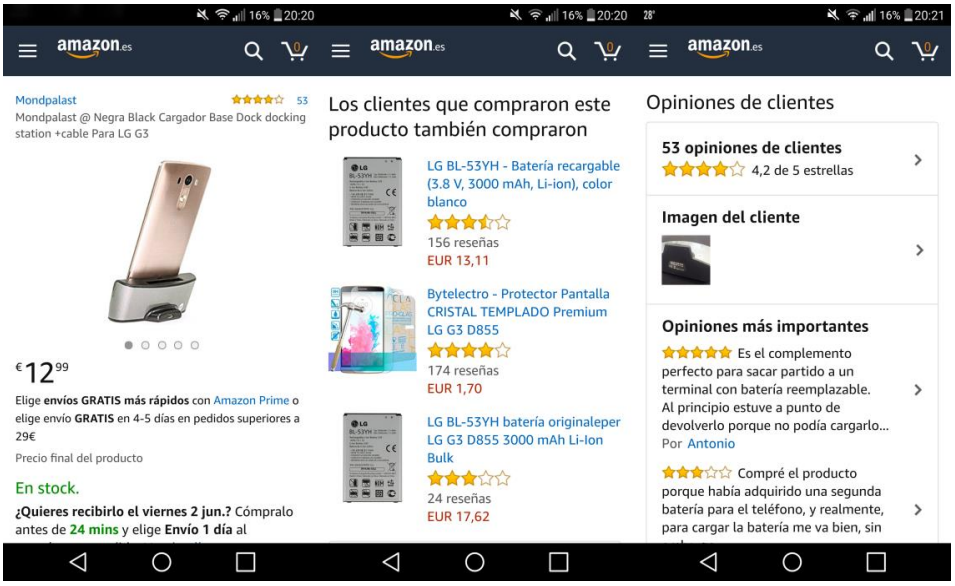

Figure 18 - Examples of mobile rating

Source: Author[27]

Loyalty programs (LO): are a type of marketing tool designed to bolster customer loyalty through planned rewards usually based on client purchase history (Bolton, Kannan & Bramlett, 2000; Uncles, Dowling, & Hammond, 2003). Loyalty programs increase operational benefits by avoiding price competition and also increase loyalty to a brand (Kim, Shi, & Srinivasan, 2001). This type of service generates cognitive implications, giving rise to a positive behavioral response and increasing customer trust through the development of an emotional link between business and consumer (Butscher, 2002). The aim of these programs is generally to retain a higher level of consumers in profitable sectors by generating a greater sense of satisfaction and value (Bolton, et al., 2000).

A large number of retailers make use of the programs (e.g., Doblecero of the Corte Inglés, Carrefour Club, or Starbucks Rewards) that offer rewards to frequent buyers. The rewards include redeemable points with discounts applicable to future purchases (see Figure XH). With the advance of data mining technologies and the growing interest in data analysis, loyalty programs are

[27] Screenshot by author of Amazon Compras applications available on Google Play. (accessed May, 2017)

expected to gain more value by offering the opportunity to collect a wide variety of customer data and their relationships with a brand/business. By way of example, Target has successfully combined data from its loyalty program with its data mining capacities. The data collected through its loyalty program, RedCard, allows Target to provide personalized offers to its most valuable consumers by analyzing their transaction histories at the individual customer level (Lim & Lee, 2015). Thus, the full potential of these services can be obtained by their integration with mobile payment applications allowing business to know, sort and offer their customers opportunities to enjoy exclusive benefits.

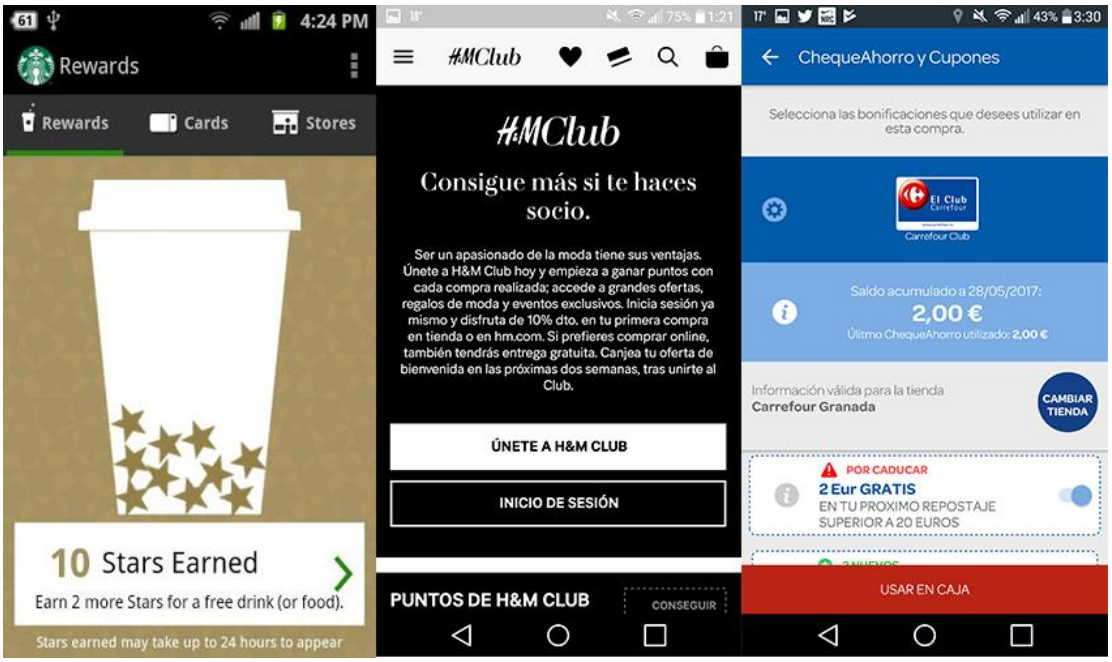

Figure 19 - Example of mobile loyalty programs

Source: Author[28] and Girish (2014)

Mobile virtual network operators (MVNO) are companies that sell mobile communication services (voice or data) under their brand without owning their own mobile network license (Pousttchi and Hufenbach, 2009). Although virtually all operations performed by the MVNO are non-strategic and treat mobile services like any other branded product, they have a very high strategic potential as they possess data of clients and their access to mobile networks. They can, depending on their type, have a direct billing and stable relationships with clients,

[28] Screenshot by author of H&M and Mi Carrefour applications available on Google Play. (accessed May, 2017).

therefore reaching a large client base (including mobile phone numbers and partial control of the device) for a variety of retail mobile services (Pousttchi & Hufenbach, 2014).

Figure 20 - Examples of MVNO in Germany, Spain and Brazil

Source: Based on Telecomvieb[29], Telcominterlex[30] and Teleco (2017)

This last service (MVNO) was not included in the doctoral research because the thesis focuses on mobile services offered by the retailers integrated in the mobile payment, and at the moment MVNO service is still hardly linked to this method of payment.

Businesses are increasingly adhering to these services as a means of mobile marketing and to generate data to guide business decisions. Most offer combined mobile services in a single mobile application. Table X, based on public information available on websites of the stores, offers a non-exhaustive list of retailers using these services (Pousttchi & Hufenbach, 2014).

The attractiveness of all these services, from the integral perspective presented in this doctoral thesis, is its role as a potential motivator to increase the use of mobile payments. It might be more convenient for both customers and business that these services be integrated into a tool for mobile payment (and not released independently) thus creating an integrated mobile services platform allowing businesses to carry out mobile marketing practices along a single channel.

[29] http://telecomvibe.com/wp-content/uploads/2015/02/Germ_mvno-copy.png (accessed May, 2017).
[30] https://telcominterlex.files.wordpress.com/2011/03/hidden_264_10446_foto_operadoras.jpg, (accessed May, 2017).

3.3 The value of mobile services for consumers

In addition to the benefits inherent to these services, the added value generated by mobile services for consumers derives from the fact that these services are accessible independent of time and place (Balasubramanian, Peterson, & Jarvenpaa, 2002; Chen & Nath, 2004), and the personalization based on time, location and personal profile (Figge, 2004). Thus the factor the serves to boost the use of mobile technologies by business is the interaction between customers and the companies offering the services, together with the increase in retailer operational efficiency (Kumar & Zahn, 2003).

Mobile marketing can serve as a tool to engage consumers in value-creating co-creation activities, regardless of time and place, driving the value generated by consumers to boost adoption even more, engender use and loyalty to retailer applications of mobile marketing, thus helping to increase the number of new customers and loyalty toward the company (Ström *et al.,* 2014).

On the other hand, the possibility of associating the profile of consumers with the use of additional functions in the purchasing process (as described in this chapter) allows differentiating individual consumer behaviors. It is important that these different behaviors be exploited since the purpose of the integration is also to provide clients with a more satisfactory experiences. In this way, it is fundamental to identify the different types of consumers and their preferences when adopting the new systems of mobile payment.

When considering the process of technology diffusion, there are certain segments of the population that are more prone to test such technology than others (Rogers, 2003). Hence, five categories can be identified: innovators (2.5%), early adopters (13.5%), early majority (34%), late adopters (34%) and laggards (16%).

Although there are only a few studies on the influence of personal innovation on the intention to use technological innovations, we believe that it is important to deepen knowledge in this area to better understand the role that this factor plays in the adoption of mobile payment, especially in the framework of the offer of additional mobile services.

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CHAPTER 4

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USER BEHAVIOUR IN QR MOBILE PAYMENT SYSTEM:

THE QR PAYMENT ACCEPTANCE MODEL (QRPAM)

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The main goal of our research is to analyze users' acceptance of Quick Response Code (QR) mobile payment systems, considering the population's widespread use of mobile devices. A comprehensive review of the scientific literature has justified the development of a behavioural model that explains intention to use of mobile payment via QR. To this end, the authors have carried out a study through an online survey to a national panel of Internet users. The results show that attitude, innovation and subjective norms are determinants of the future intention to use this technology. The conclusions and implications for management provide alternatives for companies to promote this new business by means of the new technical developments. This paper is a pioneer study of intention to use with mobile payment via QR. Classic variables from the Technology Acceptance Model (TAM), as well as variables from other recent studies, were used as models for this research (compatibility, security, personal innovation and individual mobility).

Keywords: Mobile payment, QR, Technology acceptance model (TAM), intention to use, subjective

4.1 Introduction

The rapid societal adoption of mobile phones and their role in the development of personal and professional activities has been one of the most important technological events in recent decades (Hwang et al., 2007; Masamila et al., 2010). The large number of features that help make daily life easier can explain the widespread, growing use of mobile phones. The increasing number of smartphones in the mobile market is a clear example of this trend (Calzada and Estruch, 2011). According to the International Telecommunication Union (ITU, 2012), the total number of mobile-cellular subscriptions reached almost 6 billion by end 2011, corresponding to a global penetration of 86%; the growth was driven by developing countries, which accounted for more than 80% of the 660 million new mobile-cellular subscriptions added in 2011. In light of this trend, most technology companies are focusing their efforts on increasing the number of services available, including mobile payments (Liébana-Cabanillas, 2012), which are defined as all commercial transactions which take place over networks and wireless devices (Hu et al., 2008).

These payment solutions and mobile transactions currently take various forms. Some allow traders and businesses to accept "on the go" credit card payments from customers who use a special card reader that connects to a smartphone or tablet computer. Others facilitate direct person to person (*peer to peer)* financial transfers using mobile devices, either by physical contact between the phones or through the exchange of electronic credentials, such as a phone number or email address (Smith et al., 2012). "All-in-one" payment devices offer other payment options, and a number of services in addition to identification systems, including coupon books and financial planners. This research study, a pioneer in the field, discusses both theoretical and business contributions. First, this research is based on a theoretical model developed from a classic theory (including some modifications). Secondly, the study analyzes the determinants of the adoption of new innovative payment technology in a market where currently it is only marginally employed. Finally, this study offers specific business strategies to increase potential users' intention to adopt this technology.

This paper is structured as follows: following this introduction, there is an analysis of QR payment system. The third and fourth sections outline the research hypotheses and the methodology. The fifth section discusses the results and finally, the sixth section reviews the findings, limitations and implications of the study.

4.2 Quick Response code (QR) payment systems

QR codes are storage systems which use a dot matrix or two-dimensional bar code developed by Denso Wave that can be printed or shown on a screen and are interpreted by a special reader (Denso Wave, 2000) to provide more extensive information than that found in a traditional bar code.

Figure 21 - QR example

Source: Codigos QR[31]

The information that is normally linked to a QR code includes (Fonseca et al., 2011) web addresses (pages, locations Google Maps, iTunes or YouTube links, etc.), basic texts (alerts, SMS, e mail, messages, etc.) or numeric information (phone numbers, coordinates, etc.). In the scientific literature there are many studies regarding the implementation of these codes in different ways, including: in GPS Navigation Systems (Yuan-Cheng et al., 2010); Interactive Digital Broadcasting Systems (Das et al., 2011); in the creation an Interactive Visual Document of Personal Experience (Rubin, 2012); for the visualization of architectural elements (Fonseca et al., 2011); in the development of a web 2.0-based Ubiquitous Learning Platform for Schoolyard Plant Identification (Hwang et al., 2012); mobile learning (Lai et al. 2013); systems in mobile virtual education (Power, 2012); and Mobile Augmented Reality (Yoon et al., 2011). According to the recent study by ScanLife Mobile Barcode Trend Report of ScanBuy (2012) the use of QR grew over 150% over the previous year, used mainly in packaging, mail, magazines and newspapers. The primary users of QR codes are Android OS users (48%), followed by iPhone OS users (45%), though their use in other operating systems is currently insignificant.

[31] http://www.codigos-qr.com/, retrieved in june 2017

It is very simple to generate QR codes using one of many programs that incorporate all kinds of information in the code.

While originally designed for use in the automotive industry, all kinds of companies are now using QR codes, specifically as an additional tool in advertising campaigns. Companies using these codes include textiles (WonderBra, and Calvin Klein), mobile communications (Durex), signage in advertising media (Volkswagen, H and M, Mango, Zara, etc.), product traceability (Danone), and on websites (Google Maps), etc.

As far as mobile payments are concerned, there are multiple sectors where these solutions are being implemented. To name just a few, Barclays (Barclays Pingit QR code) has developed a system allowing their clients to enter a QR code in their bills to facilitate payments, while Mastercard provides a new straightforward, streamlined payment service. In the restaurant business, Starbucks, Mc Donalds, Burguer King, KFC, Telepizza and Taco Bell, among others, provide a payment system in some of their establishments right at the point of sale, thus improving the POS service. In the retails sector, Carrefour has started to accept QR payments in some of establishment.

4.3 Theoretical background

The objective of this paper is to analyze the determinants of QR payment system adoption behavior (QRPAM). Included among the classical theories that explain human behavior in relation to the adoption of new technologies, is the Theory of Reasoned Action (TRA) developed by Ajzen and Fishbein (1980), and the Theory of Planned Behavior (TPB) by Ajzen (1991). Both have been widely used as the main theoretical framework for understanding and explaining the adoption and usage behavior of various information systems. According to Yang et al. (2012) the TRA and the TPB explain that "an individual's intention to adopt an innovation is determined by attitude and subjective norms, which are formed by behavioral and normative beliefs of an individual."

Davis (1989) developed the Technology Acceptance Model (TAM) on the basis of these theories. TAM suggests that the perceived usefulness and ease of use by an individual are the factors that determine the attitude towards the use of a specific technology, and consequently determine its intended use, resulting in it’s use (Davis et al.,1989). This model has been applied in many fields, such as the use of online services (Liao et al. 2007), mobile phones (Ervasti and Helaakoski, 2010), mobile ticketing (Mallat et al., 2009), Web 2.0 technologies in marketing

classes (Lowe et al., 2013), social networking (Lorenzo et al., 2011), e-finance (Abroud et al., 2013), online product recommendation agents (Sheng and Zolfagharian, 2014) and mobile payments (Liébana-Cabanillas et al., 2014), among others.

Most research on the adoption of mobile payment services and mobile technologies is based on existing technologies and their use. This paper focuses on a new application for the mobile payment market that is not well known and has not been widely used to date, justifying some adaptations to the theoretical models. The proposed model is based on Davis' (1989) classical model, Lu et al. (2005) and Schierz et al. (2010). In this sense Lu et al. (2005), introduce personal innovativeness as a determinant of factors related to TAM, and Schierz et al. (2010) introduce perceived compatibility and perceived safety.

4.3.1 Research Model and Hypothesis

Attitudes reflect favorable or unfavorable feelings that people express through their behavior (Fishbein, 1963; Premkumar et al., 2008), which implies that attitudes develop over time as people gain experience. Different theoretical models (TAM, TRA and TPB) have shown that attitude is a key antecedent of intention to engage in a particular behavior (Ajzen and Fishbein, 1980; Pee et al., 2008).

In this sense, many studies have identified a positive relationship between attitude and intention to use (Meharia, 2012; Hansen et al., 2012; Liébana-Cabanillas, 2012; Chen y Chang, 2013; Lee, and Ryu, 2013) leading to the following hypotheses:

H1 *Attitude toward the use of the QR system positively determines the intention to use the QR mobile payment system.*

In online environments, perceived usefulness is based on the idea that a particular technology can be helpful for someone to achieve a specific result. Vijayasarathy (2004) defines this as "the degree to which a consumer believes that online shopping will provide access to useful information, facilitate comparison of offers and enable a faster checkout."

TAM proposes that perceived usefulness is a key antecedent of attitude toward intended use (Davis, 1989) and has been verified in numerous studies (Huarng et al., 2010; Shin and Shin, 2011; Muñoz et al. 2012; Daim et al., 2013; Liebana-Cabanillas et al., 2014). Thus, the following hypothesis:

H2: *Perceived usefulness positively determines an individual's attitude toward using the*

QR mobile payment system.

Ease-of-use refers to an individual's perception that using a particular system is effortless or simply easy to do (Davis, 1989, Taylor and Todd, 1995). The design of pervasive interactions should be fully adaptable to the capabilities and skills of the expected system users, this is particularly true for people that are not familiar with information technology (Kourouthanassis et al. 2010), hence this is considered one of the most influential attributes in the adoption of a new technology (Moore and Benbasat, 1991).

Venkatesh (2000) found that perceived ease-of-use is an important factor influencing attitude towards the use of information technologies, as well as perceived usefulness, thereby justifying its inclusion in this study. In addition, Bruner and Kumar (2005) and Sanchez-Franco et al. (2007) confirmed the existence of the effects of ease of use on perceived usefulness and attitude toward using a technology.

The effect of perceived ease of use on perceived usefulness has been demonstrated in numerous studies applied in different contexts (Sanchez-Franco et al., 2007, Huarng et al., 2010; Featherman et al., 2010; Hernandez-Garcia et al., 2011) and the relationship between usefulness, attitude and intention has also been well documented (Ha and Stoel, 2009; Schierz et al., 2010; Muñoz-Leiva et al., 2012), suggesting the following hypotheses:

H3: *Perceived ease-of-use positively determines attitude towards the use of QR mobile payment system.*

H4*: Perceived ease-of use positively affects perceived usefulness of QR mobile payment system.*

Personal Innovativeness in Information Technology (PIIT), according to Agarward and Prasad (1998), can be defined as "the willingness of an individual to try out any new information technology" conceptualized as a trait, which is not influenced by environmental or internal variables. As QR payment is an innovative technology in the mobile market that is likely to be a worldwide trend in a few years, it is possible that personal innovativeness could affect the intended use of QR payments, the perceived usefulness and perceived ease-of-use. These assumptions are justified based on previous research (Lu et al., 2005; Yang et al. 2012; Wang et al., 2013; Jin et al., 2013) which outlines a PIIT effect on intentions to use a new technology, as well as determining that individuals with higher levels of PIIT develop more positive perceptions about innovation in terms of advantage, compatibility and ease of use (Lu et al., 2005). Finally, Agarward and Prasad

(1998) argue that personal innovativeness in the adoption of IT is a critical factor explaining individual consumer adoption behavior, especially in individual environments. In view of these considerations, the following hypotheses are proposed:

H5: *PIIT positively determines the perceived ease of use of QR mobile payment system.*

H6: *PIIT positively determines the intention to use QR mobile payment system.*

H7: *PIIT positively determines the perceived usefulness of QR mobile payment system.*

As discussed above, the availability of smartphones has brought about rapid adaptation by society. One of the main reasons for this is the mobility that these devices provide to their owners (Mallat et al., 2009; Weber and Darbellay, 2010), facilitating activities and allowing people to be connected in any location. This mobility involves interactions between individuals and artifacts within a given space and the degree of mobility is application-dependent (Kourouthanassis et al. 2010). Despite this, and although society subscribes to this trend, there are still differences in the amount of mobility desired by different individuals. Therefore, Schierz et al. (2010) verified the relevance of individual mobility to influence the usefulness, attitude and intention. Based on their statements, the following assumptions are made:

H8 *Individual mobility positively determines the perceived usefulness of QR mobile payment system.*

H9 *Individual mobility positively determines the attitude towards the use of QR mobile payment system.*

H10 *Individual mobility positively determines the intention to use QR mobile payment system.*

Further, compatibility can be understood as the degree to which an innovation is perceived consistent with the values, needs and past experiences of potential users (Rogers, 1983). This implies that this variable includes coherence of an innovation with the values, behavior patterns and experiences of an individual. As Tornatzky and Klein (1982) suggest, user support could be a fundamental characteristic of innovation leading to technology acceptance, especially if it is really new. As QR is completely novel, compatibility is necessary to complete the initial model (Schierz et al, 2010).

Furthermore, the relationships between perceived compatibility and perceived usefulness and the attitude toward using technology (Chen and Adams, 2005; Schierz et al., 2010) have been verified in previous research. Based on this, the following hypotheses are proposed:

H11 *Perceived compatibility positively determines the perceived usefulness of QR mobile payment system.*

H12 *Perceived compatibility positively determines the attitude toward the use of QR mobile payment system.*

Risk assessment and safety are major concerns in electronic payment systems (Ashrafi and Ng 2008). It is necessary to establish new security mechanisms for new electronic payment methods to ensure the security of customer transactions and generate confidence, thereby improving attitudes toward them. Risk is just one of the inhibitors leading to implementation of new payment systems (Pavlou, 2002b, Lee, 2009). Thus, the perception of safety of the QR payment system must be controlled (Schierz et al., 2010; Meharia, 2012) in order for this type of technology to be successfully used (Grassie, 2007). Therefore, the following hypothesis is proposed:

H13 *Perceived security positively determines the attitude toward the use of QR mobile payment system.*

As previously mentioned, QR payment systems for mobile devices are still in an early stage of diffusion and development in Spain. Normally at this stage most of the potential users of any technology lack reliable information on the use of such technology. Therefore, third parties play a large role in influencing the attitude towards the payment system (Schepers and Wetzels, 2007). Evaluations of the acceptance of technological innovations must not fail to consider the social context of decision making: if the social context is in favor of using technology, the probability of adoption by new users will increase (Webster and Trevino, 1995). Social context is included in this model through the measurement of subjective norms, defined as the degree to which an individual perceives that people who are important to him/her think he/she should use a specific system or take some action (Venkatesh and Bala, 2008).

The importance of the relationship between subjective norms and the intention to use a technology has been confirmed by several studies (Taylor and Todd, 1995; Venkatesh and Davis, 2000; Schepers and Wetzels, 2007; Yang et al, 2012; Hansen et al., 2012; Wang et al., 2013; Choi and Chung, 2013). Moreover, other studies have shown the importance of the relationship between subjective norms and attitude toward using mobile applications (Schierz et al., 2010; Grandón et al., 2011). Consequently, the last two hypotheses are:

H14 *Subjective norms positively determine the attitude towards the use of QR mobile*

payment system.

H15 *Subjective norms positively determine the intention to use QR mobile payment systems.*

All of the hypotheses in the proposed final model are summarized in Figure 2.

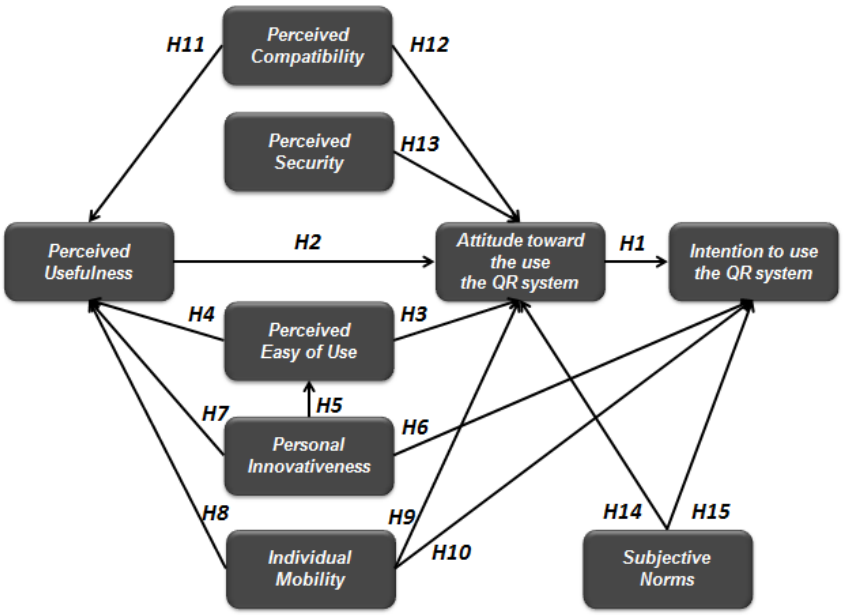

Figure 22 - Proposed model: QR Mobile Payment Acceptance Model (QRPAM)

Source: Authors

4.4 Methodology

4.4.1 Research Tools

This research used a standardized, self-administered, online questionnaire in which the user viewed a video demonstrating the new payment system. Prior to its use in this study, the questionnaire was subjected to several preliminary tests to ensure reliability.

We applied a convenience sampling method making use of the Facebook social network to target mobile phone consumers between the ages of 16 to 74. Though 242 surveys were initiated, there were only 168 surveys completed between January and April 2013. The final sample size was 168.

To ensure the validity of the questionnaire, the elements used to measure the acceptance of

QR systems were adapted from the previous studies (see Table 1). The final questionnaire consisted of 34 statements[32] that used a seven point Likert scale (1, "strongly disagree" to 7, "strongly agree"). The sample user profile is summarized in Table 2.

Table 8 - Measurement items

Construct	Items	References
Attitude toward QR payment systems	The use of QR mobile payments is a good idea.	Oh *et al*. (2003), van der Heijden (2003), Yang and Yoo (2004), Schierz *et al*. (2010)
	The use of QR mobile payments is convenient.	
	The use of QR mobile payments is beneficial.	
	The use of QR mobile payments is interesting.	
Intention to use QR payments systems	Given the opportunity, I would use a mobile QR payment system.	Davis (1989), Gefen *et al*. (2003), Venkatesh and Davis (2000), Schierz *et al*. (2010)
	I am likely to use a QR payment system in the near future.	
	I am open to using a QR mobile payment system in the near future.	
	I intend to use a QR mobile payment system when the opportunity arises.	
Perceived usefulness of QR payment systems	The QR mobile payment system is useful mode of payment.	Bhattacherjee (2001), Devaraj *et al*. (2002), van der Heijden (2003), Schierz *et al*. (2010)
	Using QR mobile payments makes the handling of payments easier.	
	QR mobile payment systems allow quick use of mobile applications (for example, ticket purchases, and use of mobile coupons, etc.).	
	I believe that the QR mobile payment system improves my consumer decisions (providing flexibility, and speed, etc.)	
Perceived ease of use of QR payment systems	It is easy to become skillful at using the QR mobile payment system.	Bhattacherjee (2001), Davis *et al*. (1989), Taylor and Todd (1995), Venkatesh and Davis (2000), Schierz *et al*. (2010)
	Interactions with the QR mobile payment system are clear and understandable.	
	It is easy to follow all the steps to use the QR mobile payment system.	
	It is easy to interact with the QR mobile payment system.	
Perceived security of QR payment systems	The risk of an unauthorized party intervening in the payment process is low.	Luarn and Lin (2005), Parasuraman *et al*. (2005), Schierz *et al*. (2010)
	The risk of abuse of usage information (e.g., names of business partners, payment amount) is low when using the QR mobile payment system.	
	The risk of abuse of billing information (e.g., credit card number, bank account data) is low when using QR mobile payment.	
	I would like QR payment systems to be safe and secure to make payment transactions.	
Perceived Compatibility in QR payment systems	QR mobile payment system use fits well in my lifestyle.	Moore and Benbasat (1991), Plouffe *et al*. (2001), Schierz *et al*. (2010)
	QR mobile payment use is consistent with the way I like to buy products and services.	
	I would use the QR payment system over other kinds payment systems (for example, cash or traditional credit cards.)	
Subjective Norms	People who are important to me would recommend using the QR mobile payment system.	Taylor and Todd (1995), Venkatesh and Davis (2000), Schierz *et al*. (2010)
	People who are important to me view the QR mobile payment system as beneficial.	
	People who are important to me think it is a good idea to use QR mobile payment systems.	
Individual Mobility	I imagine I will have several jobs at once.	Schierz *et al*. (2010)
	I would like to be connected with everyone from anywhere.	
	I would like to be able to conduct my daily work from any location.	

[32] Online questionnaire: https://granadamarketing.qualtrics.com/SE/?SID=SV_dj1TlT1Zk1ZgYux

Table 9 - Demografic profile of respondents

Division		Frequency	Percent (%)
Gender	Men	87	51.8
	Women	81	48.2
	Total	168	100
Age	Under 18	0	0
	18-24	66	39.3
	25-34	44	26.2
	35-44	40	23.8
	45-54	16	9.5
	55-64	2	1.2
	Older than 65	0	0
	Total	168	100
Education Level	No education	1	0.6
	Primary (Elementary/Middle School)	0	0
	Secondary (High School)	20	11.9
	University (Undergraduate)	107	63.7
	Postgraduate	40	23.8
	Total	168	100

4.5 Research results

4.5.1 Scale validity and reliability analysis

To check the suitability of measurement scales different reliability and validity analysis were applied, exploratory (for which we used SPSS 15.0) and confirmatory (software AMOS 16).

First as recommended by the literature, some items with variance below 0.5 were detected (Luque, 2012), and therefore, the following items were excluded from analysis: SP4 (0.05) related to the construct of perceived security, PIIT2 (0.45) and PIIT3 (0.19) related to the construct of personal innovativeness and MI1 (0.10) and MI4 (0.39) related to the construct of individual mobility.

Cronbach's α indicator was used to measure the reliability of the scales. All values were above the reference value of 0.7 (Nunnally, 1978). Furthermore, to test the convergent and divergent validity of the scales a confirmatory factor analysis was carried out.

Regarding discriminant validity, the variances were significantly different from zero and also the correlation between each pair of scales did not exceed 0.9 (Hair *et al.*, 1995).

Again the reliability of the scales can be assessed based on a number of indicators from the

confirmatory analysis. Indeed, the compound reliability of the construct (CR) and extracted variance analysis (EVA) exceeded the reference threshold, 0.7 and 0.5, respectively, as well as other indicators of overall fit for the measurement model (Hair *et al.*, 1995) (see Table 3).

Many of the values of the related sample regarding skewness and kurtosis, had problems in one way or another, so the conclusion was that the sample did not follow a multivariate normal distribution (Mardia coefficient = 198.56; CR = 30.35). Therefore, as recommended by Hair et al. (1995), the most appropriate estimation procedure seemed to be the maximum likelihood method with resampling or bootstrapping technique (with 1000 replicates).

The analysis of absolute measures, incremental and parsimony, suggests that the model fit is reasonably good (χ^2=636.001 (p= 0.00); RMSEA=0.07; TLI=0.92 CFI=0.93; GFI=0.81; IFI= 0.93).

Table 10 - Convergent validity and internal consistency reliability

Relationships between constructs			Standard Coefficient (SC)	Cronbach's α	Compound Reliability	Extracted Variance
Perceived Compatibility	→	PC1	0.89	0.869	0.88	0.71
	→	PC2	0.92			
	→	PC3	0.71			
Perceived Usefulness	→	PU1	0.82	0.874	0.87	0.62
	→	PU2	0.86			
	→	PU3	0.72			
	→	PU4	0.73			
Perceived Security	→	PS1	0.88	0.932	0.94	0.83
	→	PS2	0.99			
	→	PS3	0.85			
Attitude towards using	→	ATU1	0.82	0.886	0.88	0.64
	→	ATU2	0.78			
	→	ATU3	0.83			
	→	ATU4	0.78			
Intention to use	→	IU1	0.86	0.938	0.93	0.78
	→	IU2	0.88			
	→	IU3	0.89			
	→	IU4	0.90			
Subjective norms	→	SN1	0.82	0.914	0.92	0.80
	→	SN2	0.98			
	→	SN3	0.86			
Perceived ease of use	→	PEOU1	0.76	0.919	0.92	0.74
	→	PEOU2	0.81			
	→	PEOU3	0.93			
	→	PEOU4	0.95			
Personal innovativeness in IT	→	PIIT1	0.89	0.860	0.86	0.75
	→	PIIT4	0.85			
Individual Mobility	→	IM2	0.82	0.845	0.85	0.73
	→	IM3	0.89			

4.5.2 Analysis of the Structural model

Statistical significance of structural coefficients was analyzed to assess the structural model. The SEM estimates and hypotheses results are shown in Table 4 and Figure 3.

Table 11 - Statistical significance of standardized structural coefficients

Hypothesis				Estimates	P	Results
H1	ATU	→	IU	0.917	<0.001	**Supported**
H2	PU	→	ATU	0.692	<0.001	**Supported**
H3	PEOU	→	ATU	-0.022	0.735	Rejected
H4	PEOU	→	PU	0.471	<0.001	**Supported**
H5	PIIT	→	PEOU	0.235	0.001	**Supported**
H6	PIIT	→	IU	0.244	0.014	**Supported**
H7	PIIT	→	PU	-0.059	0.541	Rejected
H8	IM	→	PU	-0.002	0.982	Rejected
H9	IM	→	ATU	0.092	0.091	Rejected
H10	IM	→	IU	0.032	0.768	Rejected
H11	PC	→	PU	0.349	<0.001	**Supported**
H12	PC	→	ATU	0.04	0.453	Rejected
H13	PS	→	ATU	-0.009	0.808	Rejected
H14	SN	→	ATU	-0.003	0.948	Rejected
H15	SN	→	IU	0.247	<0.001	**Supported**

The first hypothesis, H1, could not be rejected ($p \leq 0.001$), therefore the attitude toward the new payment tool shows a direct and positive effect on the intention to use ($\beta=0.917$; $p \leq 0.001$) reinforcing previous results (Lu et. al, 2003). The approach of Ajzen and Fishbein (1980) verified that a positive user attitude towards a technology, referring in this case to QR mobile payments, improves their future intentions of use.

Secondly, hypothesis H2 could not be rejected. This stated that the usefulness that a user perceives towards the payment tool would have a direct effect on the user's attitude towards it ($\beta=0.692$; $p \leq 0.001$) in line with previous research (Meharia, 2012).

Third, the hypotheses derived from the effect of ease of use (H3 and H4), had a conflicting result. H3, which linked ease of use to attitude, was rejected ($\beta=-0.022$; $p=0.735$) and yet the relationship proposed in H4 received empirical support. H4 hypothesized that perceived ease of use has a positive effect on perceived usefulness ($\beta=0.471$; $p \leq 0.001$), meaning that ease of use does have an effect on the attitude towards using technology but it is not a determining factor in the attitude towards the new payment system.

The assumptions concerning the positive effects of personal innovativeness on perceived ease of use (H5) and intended use (H6), obtained empirical support (β=0.235; p=0.001 and β=0.244; p=0.014, respectively) in line with previous literature (Schierz et al., 2010, Yang et al., 2012). However, the proposal in H7 was rejected, as personal innovativeness does not directly and positively determine perceived usefulness (β=-0.059; p=0.541). It is important to stress that personal innovativeness has a decisive bearing on ease of use and intention, though not usefulness, so while this variable does not seem to directly determine perceived usefulness, there is an indirect effect, as shown in Figure 3.

Furthermore, this study does not confirm a positive relation between individual mobility and perceived usefulness of QR payments (β=-0.002; p=0.982), therefore this hypothesis was rejected. Moreover, the effect of individual mobility on attitudes towards the use of QR payment technology (β=0.092; p=0.091) is not significant, nor does it have positive effects on the intended use of QR technology for mobile payments (β=0.032; p=0.768), thereby eliminating hypotheses H9 and H10, respectively, contradicting the literature reviewed. This highlights the lack of importance of mobility, regardless of utility, attitude, and intention to use a payment system.

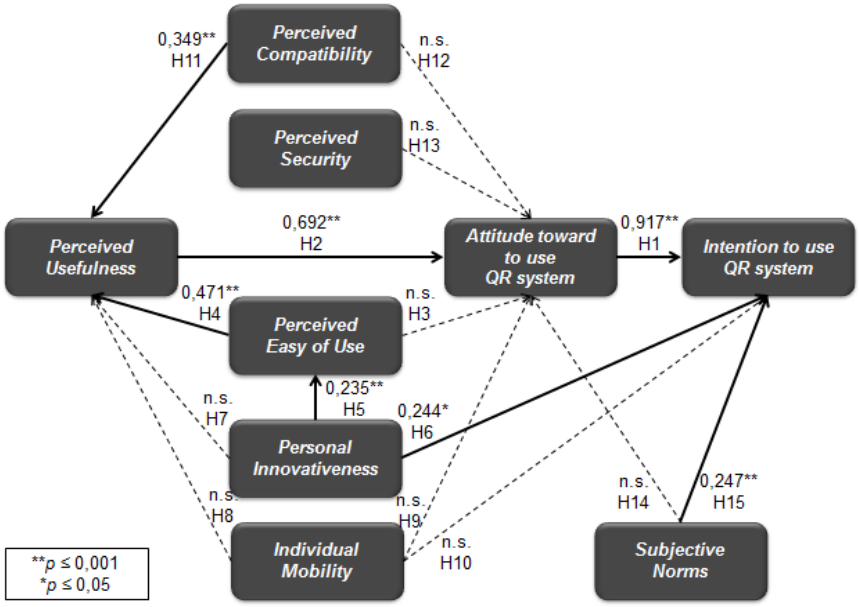

Figure 23 - Results of the estimaed model

Source: Authors

In support of H11, there is a proven, direct, positive relationship between perceived compatibility and perceived usefulness (β=0.349; $p \leq 0.001$) in agreement with the findings of Schierz et al. (2010), but H12 had no empirical support, although it indicated near significance between perceived support and attitude towards QR use (β=0.04; p=0.453). Furthermore, perceived security also has a negative relationship with attitude toward QR use (β=-0.009; p=0.808), thus rejecting H13.

Finally, the results show that subjective norms had no significant effect on the attitude towards QR use (β=-0.003; p=0.948), so H14 can be rejected. However, subjective norms do have a positive, significant effect on the intended use of such payment technology (β=0.247; $p \leq 0.001$), supporting H15 and previous results (Venkatesh et al, 2003).

The high value of intended use of QR payment systems (R^2=0.64) indicates the predictive power of intention to make payments via QR technology.

4.6 Conclusions, Future Research and Managerial Implications

4.6.1 Academic contribution and future research

The objective of this research was to analyze mobile phone user acceptance of a new mobile payment system (QR), and to determine the factors in its use. The resulting model has 64%, predictive power in intended use, a higher figure than that shown by other similar technology acceptance models (Lu et al., 2005, Lu et al., 2011).

Regarding the academic contribution of the research, this is one of the first studies to empirically analyze the determinants of consumer acceptance of QR payments. This is noteworthy, as other research literature has focused on the acceptance of mobile technologies and various forms of mobile payments using TAM as a basis.

The most influential variable on intention to use is the attitude, as it is essential to increase the intention and subsequent use of the proposed mobile payment system. Secondly, subjective norms as a social element by which the user can increase their intended use were also proven to be decisive in determining the intended use by an individual. Finally, the level of personal innovativeness also shows a significant relation with the intended use of this new tool. Although this variable has not been widely evaluated in studies on acceptance of mobile technologies, in this research it has proven relevant as users with a higher level of personal innovativeness will be more

likely to accept NFC technology for mobile payments.

In spite of the results obtained, our research had some limitations. First of all, our study aims to measure the intention to use a QR mobile payment tool. Therefore, there is no interaction whatsoever between the user and the payment system, in a country with an incipient level of acceptance. Attaining a real interaction with the system involves the use of a mobile device and a web site where the purchase can be made. However, introducing this aspect into our study would have excessively increased its complexity. Secondly, concerning the selected sample and its size, we applied a convenience sampling method, which requires a cautious treatment of the results obtained.

Regarding the data collection method, our survey was cross-sectional, a method that prevents long-term analysis of user behavior. A longitudinal study approach, not implemented in our work, could verify the robustness of the relationships and established constructs, in order to study from a temporal perspective, the evolution of the moderating effects of the gender, age and user experience variables. In addition, a preliminary qualitative approach could be of great interest due to the lack of information about these methods of payment.

Finally, on the basis of our findings and considering the limitations exposed above, we propose a series of future research lines regarding the intention to use new electronic payment systems.

Though this study focuses solely on a sample with Spanish users, to analyze user intentions and use factors in markets where this technology is emerging, it could be replicated in other countries with situations similar to that of Spain, observing possible differences between cultures and even establishing different levels of technology or technological acceptance. It would also be interesting to increase the number of individuals sampled.

To provide greater external validity for these results, a comparative study between different payment systems could be conducted, establishing a classification and a usage profile for each system. Other mobile technologies vying for a position as a substitute for payment cards could be included.

Subsequent studies should include the analysis of potential moderating effects of factors such as gender, age and even experience with similar payment tools.

4.6.2 Managerial implications

This study provides a set of recommendations for companies interested in adopting NFC technology primarily as a mobile payment tool. It also provides relevant information to increase rapid diffusion of this technology.

The success of QR mobile payment system technology relies on joint participation from multiple stakeholders, including consumers, merchants, network operators, device manufacturers, financial services, and software and technology providers. This study has only focused on the end consumer acceptance of the proposed payment system, although there are precedents where the lack of agreement between the parties has led to delays in the implementation of some technologies. A clear example related to this research relates to the implementation of QR payments where some suppliers (mainly Apple) did not promote its development due to competing commercial interests. Expansion of the use of QR codes is slightly different, as it does not require any hardware additions or changes. A (normally) free application can be downloaded and installed, to then facilitate easy payments internally through a debit/credit card linked to the telephone terminal.

Although the results of our model have reached a higher variation of the intention to use compared to similar studies (R^2=0.64) and even though our behavioral model is in line with the parameters established by prior literature, 8 hypotheses were rejected. In our view, the majority of hypotheses that are not empirically supported from individual mobility and those having an impact on attitude based on subjective norms, compatibility, ease of use and perceived security, are related to users' acceptance level of the QR technology. In parallel, there is little knowledge in the country where the study was conducted, users are not familiarized with this technology and few stores provide this quick method of payment. However, the results obtained show that the advantages of this type of payment need to be spread further (except from mobility, as users don't seem to relate it to mobile payment), in the common interest of hardware companies in the sector, telephone companies and end users.

In light of the results of this research, companies must initiate actions that improve the user's attitudes toward use of this technology (providing information, advertising, promotions, etc..) in order to increase the willingness to use this technology. These activities will promote positive attitudes towards payment systems and a successful transmission of their usefulness to enhance intended use. Companies must also control the social environment in the buying behavior of users, through appropriate promotional activity in social networks where contact between users is faster,

and could achieve results quickly.

It is also important that stakeholders promoting QR technology take into account other factors, which despite having a minor impact, are still important for the QR payment process through mobile phones. These factors include individual mobility, perceived safety, and the quality of the payment system itself (Lim, 2003) and even the existing stakeholders in the current technological environment (Dahlberg et al., 2008). Companies using QR technology still need to overcome doubts about its security, as the results of this study show. Of even greater importance is the perception of security so people have confidence and trust in the system for purchase transactions. In addition, companies utilizing QR technology should continue publicizing the benefits of QR (i.e. mobility, availability, etc.).

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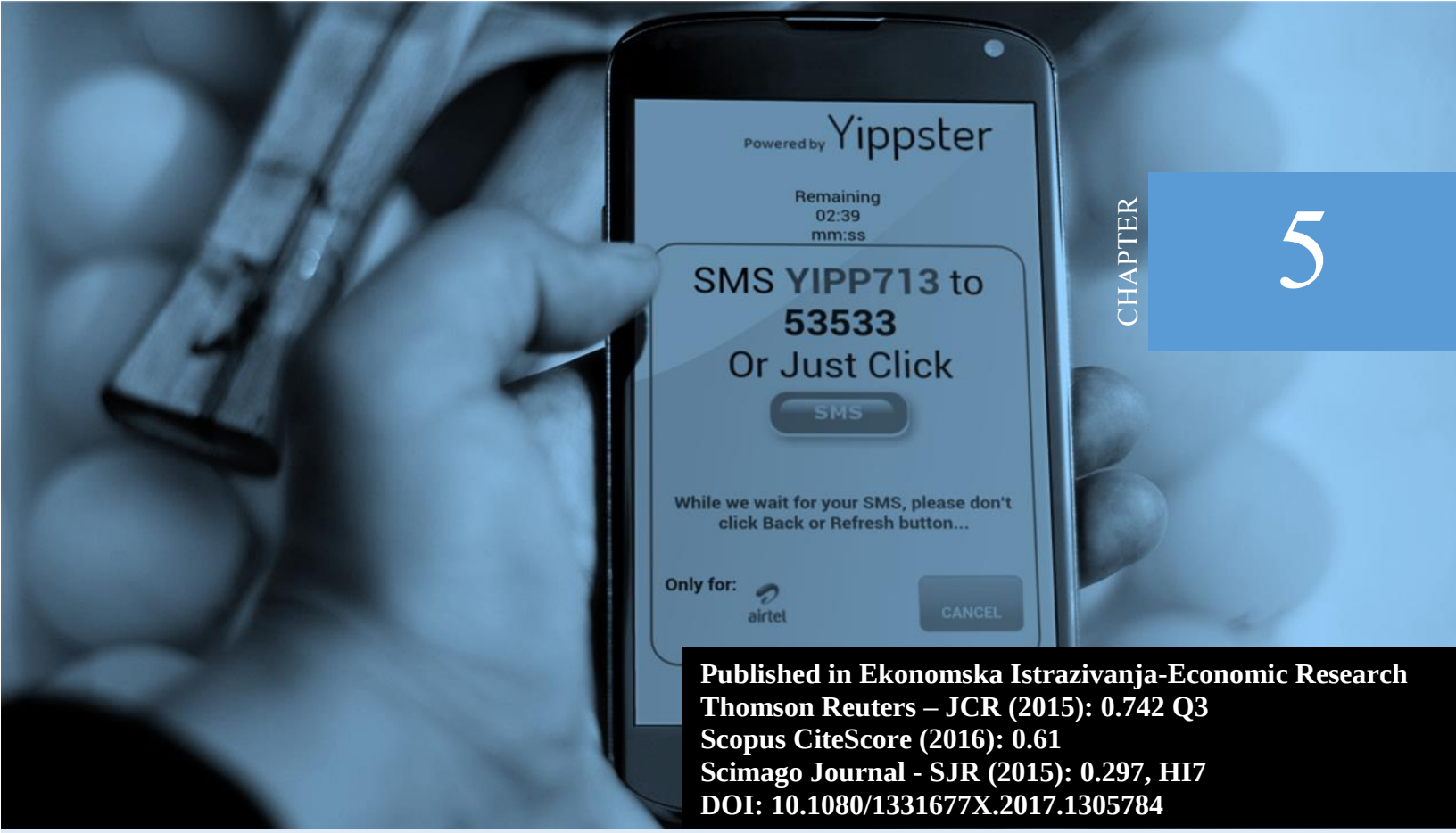

CHAPTER 5

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INTENTION TO USE NEW MOBILE PAYMENT SYSTEMS:

A COMPARATIVE ANALYSIS OF SMS AND NFC PAYMENTS

Francisco Liébana-Cabanillas; Iviane Ramos de Luna & Francisco Montoro-Ríos

The rapid growth of mobile technology among the world's population has led many companies to attempt to exploit mobile devices as an additional tool in the business of sales. In this sense, the main objective of our study resides in comparing the factors that determine the acceptance by consumers of the SMS (Short Message Service) and NFC (Near Field Communication) mobile payment systems as examples of means of future payment. The model used in our research applies the classic variables of the Technology Acceptance Model, as well as that of Perceived Security, a model deriving from the review of the major relevant recent literature. The results achieved in this study demonstrate that there are differences in the factors that determine the acceptance in each of the systems, as well as the level of the Intention to Use. Finally, we highlight the main implications for management and cite some strategies to reinforce this new business in the context of new technical developments.

Keywords: Mobile payment adoption, SMS, NFC, Intention to use

5.1 Introduction

In recent years, mobile devices such as smartphones, personal digital assistants (PDAs), wireless tablets, and laptop computers transmit all kinds of data. These devices now also serve to pay for goods and services by means of the transmission of data, a system known as mobile payments (m-payments). Any wireless means to initiate, activate or confirm a payment is considered an m-payment (Geva, 2012). Liébana-Cabanillas (2012) goes on to propose that any personal or commercial activity involving an electronic device connected to a mobile network to complete an economic transaction can also be considered an m-payment.

This study focuses on the two largest current mobile systems of payment. The first, Short Message Service (SMS) is remote, whereas the second, Near Field Communication (NFC) requires close proximity. The use of SMS for mobile payment requires a communication protocol that allows the exchange of short text messages between two mobile devices (Valcourt, Robert, & Beaulieu, 2005). The SMS system, however, faces the following four drawbacks related to security (Ivarsson, 2008): (1) the problem of storage in the terminal receptor after completion of the message, (2) the absence of coding, (3) the lack of a delivery confirmation, and (4) the reduced capacity of transmission due to a limit of 160 characters. According to recent studies, the SMS has been the more conventional means of payment and obtains the greatest profit among m-payment applications (Kadhiwal & Zulfiquar, 2007). The SMS employs the following technologies: GSM (Global System for Mobile Communications), GPRS (General Packet Radio Services) and UMTS (Universal Mobile Telecommunications System) (Sebola & Penzhorn, 2003). However, in light of the rapid growth of smart phones and their new features, NFC use is on the rise.

Near Field Communication (NFC) payments, on the other hand, are made in person in a store or at a compatible terminal by simply approaching the mobile device to the terminal. The major advantages NFC technology (Grassie, 2007) are the following: 1) its scope and availability; it can be implemented in all existing mobile terminals (on the condition of the installation of a chip) generating a wide range of new services for users and the terminal itself, 2) its wide range of applications (paying bills, car payments, leisure, etc.), 3) its ease of use because it only requires that the parties involved be within a specific proximity, 4) its security, since it requires the user to manually activate or approach the receiver for payment, demanding proactive behavior from the user, 5) the generation of added value services, 6) its use on devices equipped with contactless features, and its use as a platform to receive cash, make payments and pay for transport worldwide,

and finally, 7) its economic attractiveness because it is based on open standards and users are not obliged to pay licensing fees.

Although there have been many attempts in the last decade to use mobile devices for business-to-consumer payments (B2C), none have gained particular success (Pousttchi, Schiessler, & Dietmar., 2009). The following drawbacks have been detected: (1) the high costs of the implementation the technology and ensuing financial fees (Islam, Ahmad, Khan, & Ali, 2010), (2) the complexity of the systems (Balan, Ramasubbu, Prakobphol, Christin, & Hong, 2009), (3) the diversity of the types of services and the lack of unified systems of payment (Liébana-Cabanillas, 2012), (4) the large spectrum of types of terminals hindering the implementation of uniform measures of security, control and monitoring (Islam et al., 2010), (5) the mistrust of these types of transactions (Wu, Li, Dai, & Zhao, 2010), (6) the immaturity of some markets, especially emerging economies, that reject new technology (Wu et al., 2010), and (7) the limited rate of penetration in Third World countries and emerging economies (Saidi, 2010).

In spite of this initial lack of success, and due to the advances in mobile technology and the reduction of technical barriers for m-payments, we believe that this means of payment will eventually become more commonplace and simple to use in the coming years. According to a recent study from Accenture (2015), consumers see, in the next years, a decrease in the use of traditional payment instruments in favor of an increase of digital payments. By the end of the decade, the study expects a significant boost in the use of retail apps (8%), Apple Pay™/Samsung Pay™ (7%) and PayPal (6%). In 2016, total mobile payment transactions will attain $27.05 billion, with users spending an average of $721.47 annually (eMarket, 2015). One of the reasons that the total mobile payment sales will rise faster than average spending per user in 2016 is due to the growth of use of this technology.

In other hand, this growth is due to the fact that consumers in more developed countries frequently make small payments from their mobile phones for purchases of digital content (games, wallpapers, etc.) or applications (mainly iPhones or Androids). In developing countries, the poor quality of existing means of payment opens a great window of opportunity for the future use of m-payments (Bourreau & Verdier, 2010).

For this reason, in light of this new potential market, and owing to the limited amount of relevant published scientific research, our work aims to analyze the determining factors associated with to the adoption of new mobile payment technology by focusing on the two previously cited

payment systems (SMS and NFC). To achieve this, we have applied a revised model of theoretical behavior deriving from classic theory. In this manner, we offer a review of the different variables that have been analyzed over the last years in the study of mobile commerce and in the study of mobile payment models by means of the Technology Acceptance Model (TAM) with the aim to compare and justify the suitability of the proposed model. From the results obtained after evaluating the process of acceptance of the mobile payment technologies, we will offer recommendations from the business standpoint to improve the *intention of use* of potential consumers by means of specific strategies.

5.2 Theoretical Background

Among the classic theories that explain human behavior related to adopting new technologies is the Theory of Reasoned Action (TRA), developed by Ajzen and Fishbein (1980), and the Theory of Planned Behavior (TPB) by Ajzen (1991). Both have been widely applied as the principal theoretical framework for understanding and explaining the adoption and usage behavior of various information systems. According to Yang, Lu, Gupta, Caso, and Zhang (2012), the TRA and the TPB spell out that "an individual's intention to adopt an innovation is determined by attitude and subjective norms, which are formed by behavioral and normative beliefs of an individual."

Davis (1989) developed the Technology Acceptance Model (TAM) on the basis of these theories. TAM suggests that the *perceived usefulness* and *ease of use* by an individual are the factors that determine the *attitude* towards the adoption of a specific technology, and consequently determine his *intention to use* resulting in the adoption of the technology (Davis, Bagozzi, & Warshaw, 1989). This model has been applied in many fields such as online services (Liao, Chen, & Yen, 2007), mobile phones (Ervasti & Helaakoski, 2010), mobile ticketing (Mallat, Rossi, Tuunainen, & Öörni, 2009), social networking (Lorenzo, Alarcón, & Gómez, 2011), healthcare information systems (Pai & Huang, 2011) and mobile payments (Liébana-Cabanillas, 2012; Luna, 2012).

Although the TAM has undergone several revisions (Lee, Hu, & Yeh., 2003; Liébana-Cabanillas, 2012), it is still considered the most solid, rigorous and influential model related to the behavior of technology acceptance (Davis, 1989; Davis et al., 1989). Precisely for this reason it has been adopted in many mobile payment studies (Table 5).

Table 12 - Overview of TAM research used in studies explaining mobile payment.

Author	Concepts From Original Tam Used	Additional Concepts	Background Characteristics
Nysveen, Pedersen and Tohorbjornsen (2005)	BI, AT, PU, PEOU	Perceived Behavioral Control, Normative pressure, Perceived Enjoyment and Perceived Expressiveness	Gender, Age, Education
Mao, Srite, Thatcher and Yaprak (2005)	BI, PU, PEOU	Price, Accessibility, Mobile, Phone efficacy and Perceived innovativeness	Gender, Age, Nationality, Education
Chen (2008)	PU, PEOU, BI	Perceived transaction convenience, Perceived transaction speed, Security concerns, Privacy concerns, Perceived Risk and Compatibility	
Schierz, Schilke and Wirtz (2010)	PU, PEOU, AT, BI	Perceived compatibility, Perceived security, Individual mobility and Subjective norms	
Shin (2009)	PU, PEOU, AT, BI	Perceived security, Trust, Perceived Self-efficacy and Social Influence	Gender, Age, Income
Chandra, Srivastava and Theng (2010)	PU, PEOU, BI	Perceived reputation, Perceived opportunism, Perceived Risk, Perceived structural assurance and Consumer trust	Gender, Age, Mobile internet, Internet banking
Mehra (2010)	U, BI, PU,PEOU	Usage process, Individual characteristics, Technology characteristics, Context, Communication/task characteristics and Modality of mobility	Gender, Age, Marital status, Employment status, Education, Annual income, Occupation, Residency status, Ethnicity, Use mobile phone, Mobile provider, Pre-paid or on-account
Kim, Mirusmonov and Lee (2010)	PU, PEOU, BI	Innovativeness, M-payment Knowledge, Mobility, Reachability, Compatibility and Convenience	Early Adopter and Late Adopter
Zhang, Yue and Kong (2011)	PU, PEOU, BI	Perceived Risk and Subjective norms	Uncertainty Avoidance, Individualism

Lu, Yang, Chau and Cao (2011)	BI	Perceived Cost, Perceived Risk, Relative advantage, Compatibility and Image	Internet Payment Trust, Initial Mobile Payment Trust
Yang et al. (2012)	BI	Perceived Risk, Perceived fee, Compatibility, Relative advantage, PIIT and Subjective norms	Potential adopters, Current users
Liébana-Cabanillas (2012)	PU, PEOU, AT, BI	Subjective norms, Social Influence, Trust, Quality and Risk	Gender, Age, experience
Liébana-Cabanillas, Muñoz-Leiva, Ibáñez-Zapata and Rey-Pino (2012)	PU, PEOU, BI	Trust and Risk	
Liébana-Cabanillas, Sánchez-Fernández and Muñoz-Leiva, (2014)	PU, PEOU, AT, BI	Subjective norms, Trust and Risk	Experience
Luna, Montoro-Ríos and Liébana Cabanillas (2015)	PU, PEOU, AT, BI	Perceived compatibility, Perceived security, Individual mobility, Subjective norms and PIIT.	
Liébana-Cabanillas, Luna and Montoro-Ríos (2015)	PU, PEOU, AT, BI	Perceived compatibility, Perceived security, Individual mobility, Subjective norms and PIIT.	
Note: PU – Perceived Usefulness; PEOU – Perceived Ease of Use, AT – Attitude toward use, BI – Behavior Intention to use, U – Use Source: Authors and the references included in these table			

Furthermore, the adoption of different payment tools has been analyzed in previous research. This is the case of smart cards (Plouffe, Hulland & Vandenbosch, 2001) and credit cards (Qi & Yang, 2003). The study of mobile payments in different countries has also been undertaken. Cheong, Park and Hwang (2004) analyzed the transition from credit cards to mobile payments in Korea while Dewan and Chen (2005) explored the factors that determine the adoption of m-payment by consumers in the United States. Teo, Fraunholz and Unnithan (2005) explored

inhibitors and facilitators in the adoption of mobile phones as payment devices in Australia. The adoption of mobile payment systems was also the object, among others, of studies by Yang et al. (2012) in China, Balachandran and Tan (2015) in Malaysia, Gao and Waechter (2015) in Australia and Slade, Dwivedi, Williams and Piercy (2016) in the United Kingdom. Despite this earlier research, no empirical comparative studies regarding current mobile payment systems have been undertaken. Hence the relevance of the present work.

5.3 Conceptual model and research hypothesis

Most research on the adoption of mobile payment technologies and mobile services is based on existing technologies and their use. The goal of this study is to compare the SMS and NFC systems of payment in accordance with previously established relationships and draw up a model based on the behavior towards mobile payment systems. The present study specifically proposes the following ideas: (1) that subjective norms may have a direct or indirect impact on the intention to use, ease of use and perceived usefulness, (2) that the ease of use determines the usefulness of the payment devices and the consumer's attitude, (3) that the potential consumer's perceived usefulness of the good is related to his attitude and intention to use mobile payment methods, (4) that the attitude determines directly the intent, and (5) that the perception of security positively affects the behavior of the consumer. We have selected precisely this last variable of security since it, along with the question of risk, is the most common variable cited in the existing research.

5.3.1 Subjective norms

Social influences in the form of subjective norms are used as factors both in models of technology acceptance and in their subsequent adaptations (Venkatesh & Bala, 2008). This factor is defined as the degree of an individual's perception of what people important to him consider on whether he should adopt a system or perform a certain action (Venkatesh & Bala, 2008). This social construct is composed of two basic underlying sets of factors. First are the beliefs that the consumer has of the people considered as a reference, and second is the motivation of the person to behave according to the desires of the people of reference (Herrero, García, & Rodríguez Del Bosque, 2005). From this point of view, many authors have identified a direct and positive link between *subjective norms* and *ease of use* (López-Nicolás, Molina-Castillo, & Bouwman, 2008), *usefulness*

(Zhang, Yue & Kong, 2011) and, of course, the *intention to use* (Shin, 2009). Therefore, we propose the following hypotheses:

Hypothesis 1: *The subjective norms of individuals positively determine the ease of use of mobile payment systems.*

Hypothesis 2: *The subjective norms of individuals positively determine the usefulness of mobile payment systems.*

Hypothesis 3: *The subjective norms of individuals positively determine the intention to use mobile payment systems.*

5.3.2 Perceived usefulness

The importance of perceived usefulness has been widely recognized in numerous studies (Guriting & Ndubisi, 2006). Perceived usefulness is the subjective probability that technology can improve the way a consumer completes his goal. In the context of our study, perceived usefulness will improve the consumer's attitude and intention to use mobile payment systems.

According to TAM, the perceived usefulness is the degree to which a person believes that adopting a particular system will increase his effectiveness and job performance (Davis, 1993). Different studies have demonstrated that perceived usefulness has a direct relationship with attitude (Muñoz, Hernández-Méndez, & Sánchez-Fernández, 2012; Shin, 2012), as well as the intention to use (Pai & Huang, 2011; Liébana-Cabanillas, Sánchez-Fernández, & Muñoz-Leiva, 2014). In the context of our research, we consider that the perceived usefulness of the payment system will influence the intention to use through user's attitude toward the payment system. The perceived usefulness of the system of payment will also ~~be~~ directly influence the intention to use based on the principles of TAM. Based on the preceding thoughts, we propose the following hypotheses:

Hypothesis 4: *Perceived usefulness positively influences the attitude towards the intention to use mobile payment systems.*

Hypothesis 5: *Perceived usefulness positively influences the intention to use mobile payment systems.*

5.3.3 Ease of use

The ease of use refers to the individual's perception that using a particular system will be effortless or, simply, easy to handle (Davis, 1989). It is therefore considered one of the most influential aspects regarding the decision to adopt new technology. For Davis, Bagozzi and P.R. Warshaw (1989) the question of ease of use has a double impact. It has, on the one hand, an impact on the attitude, because self-efficacy and instrumentality, and secondly by its utility as shown by the TAM (Muñoz, 2008).

The effect of the perceived ease of use of a product on the perceived usefulness has been demonstrated in numerous researches from different contexts (Muñoz et al., 2012; Liébana-Cabanillas, Muñoz-Leiva, Ibáñez-Zapata & Rey-Pino, 2012). The relationship between the ease of use, attitude and intention to use has also often been examined (Hernández, 2010). Under such circumstances we advance the following hypotheses:

Hypothesis 6: *The perceived ease of use positively influences the usefulness in the adoption of mobile payment systems.*

Hypothesis 7: *The perceived ease of use positively influences the attitude towards the intention of mobile payment systems.*

5.3.4 Attitude

Empirical studies of the dissemination of technological innovations have expanded the use of the TAM model to include the factor of attitudes, as proposed by the Theory of Reasoned Action (TRA) of Davis et al. (1989). According to Polatoglu and Ekin (2001), a consumer's decision to adopt a product depends on his attitude toward the product, that is, his beliefs of its purpose and perceived importance. Consequently, in the online environment, it is expected that attitude facilitate transactions and reduce the barriers to the adoption of the terms of trade (Pavlou, 2002a; Pavlou, 2002b), and more specifically, in our case, favor the intention to use mobile payment systems (Schierz, Schilke & Wirtz, 2010). In line with previous research (Tsai, Zhu, Ho, & Wu, 2010; Yoon and Kim, 2013), we propose a similar relationship in the case of the new systems of payment. This results in the following hypothesis:

Hypothesis 8: *The attitude toward the* intention to use *is an antecedent of intention to use mobile payment systems.*

5.3.5 Perceived security

From the classic studies of Bauer (1960) that highlighted that risk is a factor in consumer behavior since the consequences of the use of a product cannot be anticipated with certainty, to the latest research related to payment systems, the perception of security has always been associated with negative consequences that the consumer might suffer if he modifies his intention to use.

Some research suggests that the risk perceived among consumers of online shopping is one of the main factors that hinder its development (Gefen, Karahanna, & Straub, 2003a; Gefen, Karahanna, & Straub, 2003b). For this reason, companies are attempting to curtail this perception in order to minimize its impact and enhance the perception of security.

Security and the perception of risk are major concerns in the field of electronic payment systems (Ashrafi & Ng, 2008). It is therefore necessary to establish new security mechanisms for new electronic payment systems so as to protect customer transactions and generate confidence, hence improving attitude. It is precisely this risk that is a major inhibitor of the implementation of new payment systems (Pavlou, 2002b; Lee, 2009). Consequently, we consider that the perception of security in accepting new payment systems must be controlled (Schierz et al., 2010) for this type of technology to be successful (Grassie, 2007). We propose the following research hypothesis:

Hypothesis 9: *Perceived security positively influences the intention to use mobile payment systems.*

Figure 4 summarizes the relationships collected by previous research hypothesis.

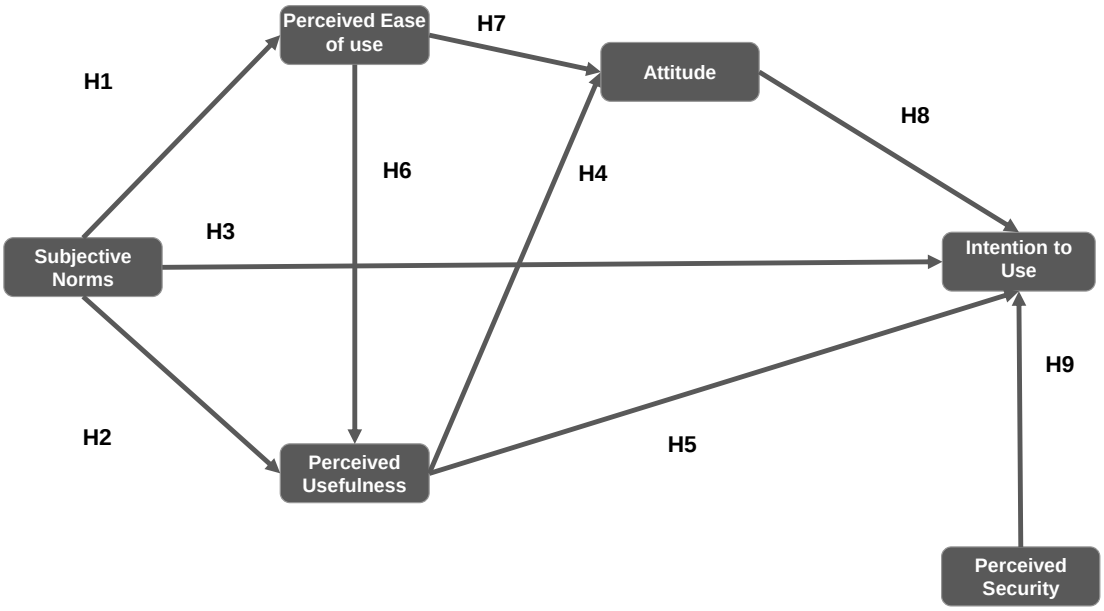

Figure 24 - Research model

Source: Authors.

5.4 Methodology: scope of study, measurement scales and data collection

To evaluate the proposed behavioral model, two self-administered questionnaires were created to be filled out by the consumer after watching an explanatory video describing the new SMS and NFC payment systems. However, prior to distribution, the questionnaire was subjected to several preliminary tests to ensure its reliability.

5.4.1 Development of the measurement scales

The questionnaire consisted of closed questions for the constructs, seven-point Likert scales, and socio-demographic data. Specifically, we adapted the scales of Venkatesh and Davis (2008) and Schierz et al. (2010) to measure *subjective norms* about SMS/NFC mobile payment systems. The *attitude to use sc*ale was adapted from research conducted by Heijden (2003), Yang and Yoo (2004) and Schierz et al. (2010). The *usefulness scale* was adapted from the work of Bhattacherjee (2001), Heijden (2003) and Schierz et al. (2010). The *perceived ease of use scale* was adapted from Bhattacherjee (2001), Davis et al. (1989), Venkatesh and Davis (2000) and Schierz et al. (2010). The *perceived security scale* (three items) was adapted from the scales of Parasuraman, Zeithaml and Malhotra (2005) and Schierz et al. (2010). Finally, *the intention to use*

scale was adapted from Davis (1989), Gefen, Karahanna, and Straub (2003a and 2003b), Venkatesh and Davis (2000) and Schierz et al. (2010).

To verify the *suitability of the measurement scales*, their reliability and validity were analyzed by both exploratory (SPSS 18.0) and confirmatory (AMOS 18) methods (see Data analysis section).

5.4.2 Data collection

Our research applied a standardized, self-administered, online questionnaire based on a prior viewing of a video describing each of the proposed payment systems. Before the survey took place, to ensure its reliability, the questionnaire was subject to several preliminary tests.

We employed a quota sampling method based on the characteristics of consumers reflected in the Survey on Equipment and Use of Information Technologies and Communication in Homes INE, a project that took into account a national panel of Internet users. For SMS payment system, the survey was conducted between January and February 2012 and attained a valid sampling size of 584. For the NFC payment system, the survey was conducted between July and August 2012 and attained a valid sampling size of 287.

Finally, it must be noted that a random selection was carried out among the first experiment (SMS) in order to attain a statistically similar sampling number for both payment system studies.

5.5 Data analysis and results

5.5.1 Reliability and validity

Cronbach's α indicator was first used to measure the reliability of the scales, with 0.7 as the reference value (Hair, Anderson, Tatham, & William, 1995). All the variables obtained very good values in the two groups or subsamples ($\alpha > 0.8$). To test the convergent and divergent validity of the scales, a confirmatory factor analysis was performed. In this analysis the items that contributed least to the explanatory power of the model was eliminated ($R^2 > 0.5$). Convergent validity was evaluated by means of the factor loadings of the indicators. The coefficients were significantly different from zero, and the loadings between latent and observed variables were high in all cases ($\beta > 0.7$). Consequently, we can deduce that the latent variables adequately explain the observed variables (Bollen, 1989; Hair et al., 1995).

With regard to discriminant validity, the variances were found to be significantly different from zero. Moreover**,** the correlation between each pair of scales did not exceed 0.8. Given the weak relationship among the constructs, we can therefore confirm that there are five constructs in each of the two models.

The reliability of the scales can again be evaluated from a series of indicators drawn from the confirmatory analysis. The composite reliability and the average variance exceeded the threshold used as a reference at 0.7 and 0.5, respectively, as well as other indicators of overall fit for the measurement model (Hair et al., 1995) (Table 6).

Table 13 - Convergent validity and internal composite reliability

Relationships between Constructs			SMS				NFC			
			Standard Coefficient	Cronbach's α	Composite reliability	Variance explained	Standard Coefficient	Cronbach's α	Composite reliability	Variance explained
Subjective norms	→	SN1	0,879	0,92	0,92	0,79	0,887	0,93	0,93	0,82
	→	SN2	0,874				0,951			
	→	SN3	0,908				0,879			
Perceived ease of use	→	PEOU1	0,782	0,80	0,83	0,81	0,741	0,91	0,92	0,74
	→	PEOU2	0,942				0,810			
	→	PEOU3	0,899				0,938			
	→	PEOU4	0,789				0,936			
Perceived Usefulness	→	PU1	0,816	0,92	0,93	0,76	0,769	0,87	0,88	0,65
	→	PU2	0,957				0,819			
	→	PU3	0,827				0,858			
	→	PU4	0,880				0,859			
Attitude to use	→	AT1	0,761	0,93	0,93	0,78	0,855	0,92	0,92	0,74
	→	AT2	0,935				0,866			
	→	AT3	0,918				0,894			
	→	AT4	0,911				0,832			
Perceived Security	→	PS1	0,730	0,88	0,88	0,71	0,911	0,92	0,93	0,81
	→	PS2	0,855				0,940			
	→	PS3	0,934				0,847			
Intention to use	→	IU1	0,892	0,94	0,94	0,83	0,880	0,93	0,93	0,82
	→	IU2	0,904				0,893			
	→	IU3	0,944				0,948			

Source: Authors

5.5.2 Structural equation model

After evaluating the reliability and validity of the measurement scales, the research hypotheses based on the review of the literature were tested. For this a structural equation model was developed for each group. Considering the absence of normality of the variables, we opted for the maximum likelihood estimation method and bootstrapping technique (or bootstrap learning samples) for 500 consecutive steps or samples, and a significance level of 95 percent. The maximum likelihood is preferable in the case of small samples, as opposed to generalized or weighted least squares (West, Finch, & Curran, 1995). For the bootstrapping technique we used the Bollen-Stine's corrected p-value, testing the null hypothesis that the model is correct. Through re-sampling, this technique permits the standard error of the constructs to be corrected.

Before evaluating each of the two models in further depth and examining the differences among them, the overall goodness of fit was verified and seen to be satisfactory as the values of the goodness of fit indicators were within the levels recommended in the literature (Bollen, 1989; Muñoz, 2008) RMSEA < 0, 08 GFI and AGFI > 0, 80, CFI and NFI > 0, 90 (see Table 3).

5.5.3 Hypothesis testing

To assess the structural model for statistical significance, the model structural loads were analyzed. Both the SEM analysis results and the results of the hypotheses are shown in Table 7.

Table 14 - Non- standardized coefficients (β) of the models, Goodness-of-fit indicators in the structural model and Comparison of models SMS versus NFC

Hypothesis	SMS			NFC			Comparision SMS versus NFC	
	β_{sms}	S.E.	Sig.	β_{nfc}	S.E.	Sig.	t-Student	p-valor
H1. Subjective Norms →Perceived Ease of Use	0,336	0,067	***	0,407	0,053	***	-0,83	0,4063
H2. Subjective Norms → Perceived Usefulness	0,474	0,056	***	0,390	0,054	***	1,08	0,2807
H3. Subjective Norms → Intention to use	0,119	0,055	**	0,353	0,072	***	**-2,58**	**0,0101**
H4. Perceived Usefulness →Attitude	0,475	0,054	***	0,955	0,110	***	**-3,92**	**0,0001**
H5. Perceived Usefulness → Intention to Use	0,162	0,065	**	0,336	0,109	***	-1,37	0,1709
H6. Perceived Ease of Use → Perceived Usefulness	0,272	0,052	***	0,500	0,067	***	**-2,69**	**0,0074**
H7. Perceived Ease of Use → Attitude	0,213	0,045	***	-0,078	0,088	n.s.	**2,87**	**0,0042**
H8. Attitude → Intention to Use	0,273	0,072	***	0,375	0,081	***	-0,94	0,3470
H9. Perceived Security → Intention to Use	0,065	0,035	**	0,078	0,047	**	-0,22	0,82
Coefficients								
RMSEA	0,060			0,062				
X^2	364,820			378,041				
df	179			179				
Bollen-Stine's p	0,002			0,001				
NCP	185,820			199,041				
RFI	0,918			0,922				
GFI	0,892			0,886				
AGFI	0,860			0,853				
NFI	0,930			0,933				
CFI	0,963			0,964				

Note 1: ** 0, 1 of significance; *** 0, 001 of significance.
Note 2: The results in bold represent significant differences (significance <0.05) in the relationships between certain variables of the two structural models.
Source: Authors

In the first place, hypotheses 1, 2 and 3, deriving from the effect of subjective norms over the *ease of use*, *perceived usefulness* and *intention to use*, cannot be rejected ($p < 0,10$). In this case the subjective norms have a direct and positive relation over the *ease of use* ($\beta sms = 0,336$ $p < 0,001$; $\beta nfc = 0,407$ $p < 0,001$), over the *usefulness* ($\beta sms = 0,474$ $p < 0,001$; $\beta nfc = 0,390$ $p < 0,001$) and over the *intention to use* ($\beta sms = 0,119$ p

<0,10; βnfc = 0,353 p <0,001). These results reinforce the conclusions of previous research (Zhang et al., 2011).

Secondly, the relationship between the *usefulness* and the *attitude* and *intention* in hypotheses 4 and 5 also cannot be dismissed. In this situation, the *usefulness* that the consumer perceives toward the payment device will have a direct effect both on his *attitude* toward it (βsms = 0,475 p <0,001; βnfc = 0,955 p <0,001) and on his intention to use it in the future (βsms = 0,162 p <0,10; βnfc = 0,336 p <0,001). These relationships involve a direct and positive relationship between the value of the means of payment and the user's attitude and intention toward it (Lorenzo et al., 2011).

Furthermore, the hypothesis derived from the effect of *ease of use* (hypotheses 6 and 7) also cannot be put into question in the case of the SMS payment system and can only partly be rebuffed in the case of NFC. In this sense, the *ease of use* reveals a direct and positive relationship with the *attitude* of the consumer (βsms = 0,213 p <0,001; βnfc = -0,078 p = 0,421) due to the relative lack of effort that he must invest, compared the large effort inherent to starting from scratch with a new device (Muñoz et al., 2012). This is verified in the case of SMS and in the *usefulness* (βsms = 0,272 p <0.001; βnfc = 0,500 p <0.001) that consumers bestow on the new mobile payment system (Lorenzo et al., 2011).

Moreover, hypothesis 8, which places in relation a favorable *attitude* towards the payment system and its *intended use*, cannot be completely rejected (βsms = 0,273, p <0,001; βnfc = 0,375, p <0,001). Following the thought of Ajzen and Fishbein (1980) and other later works, the favorable *attitude* of a consumer toward a mobile payment tool proposal will improve his intention to adopt it. Even though it is difficult to define the attitude of a potential user due to the multidimensionality of the construct, this relationship has been proven in research related, among others, to mobile payment systems (Shin, 2009; Schierz et al, 2010).

Finally, hypothesis 9 reveals a positive relationship between the *perceived security* and the *intent of use* (βsms = 0,065 p <0,10, p = 0,078 βnfc <0,10). In this case, when the system of payment is considered secure, the intent of the consumer will increase**.** This is a result that coincides with the conclusions obtained in other research (Lee, 2009).

5.5.4 Comparison of models

To demonstrate the existence of a common model for the two payment systems (SMS and NFC) after their evaluation, we compared the regression coefficients or weights in pairs between the structural models using a modified version of Student's t-test for independent samples (Chin, 2000). The evaluation was performed using the procedure suggested by Chin (2000) to develop a multi-group analysis based on Student's t-test according to the following formula:

Ho: B1 = B2

$$t = \frac{B_1 - B_2}{\sqrt{SE_1^2 + SE_2^2}} \qquad (1)$$

Where *Bi* denotes path weights and *SEi* is the standard error of the path in the structural model.

The results reveal significant differences (significance < 0.05) in the relationships between certain variables of the two structural models (see Table 3). These differences are especially pronounced in the relationships between *subjective norms* and *intention to use* (difference= -2,58; p=0,01), perceived *usefulness* and *attitude* (difference= -3,92; p= 0,00), perceived *ease of use* and perceived *usefulness* (difference= -2,69; p= 0,00), and finally, perceived *ease of use* and *attitude* (difference= 2,87; p=0,00).

The largest differences are between perceived *usefulness* and *attitude* and perceived *ease of use* and *attitude*.

Precisely the *ease of use* will become more important in the SMS payment system due to its relationship with *attitude*, while *subjective norms* and perceived *usefulness* show a greater relevance with the NFC payment system due to its impact on *attitude* and *intention*.

The results indicate that the model of mobile payment behavior cannot be applied in a global manner and the relationships proposed in the model are expressed with different intensity depending on the system of payment under study.

5.6 Discussion

The goal of our research is to analyze the acceptance by consumers of the NFC and SMS mobile payment systems from a behavioral model standpoint and determine its constitutive factors. In this sense**,** the models explain the variation in the intention of use

of the values of 0,557 and 0,654, higher than those advanced by analogous models of technology acceptance (Lu, Yang, Chau, & Cao, 2011).

On the question of the academic contribution of this research, it is noteworthy that although other work has been carried out on the subject of the acceptance of mobile technologies, as well as on the different forms of mobile payments using as a basis the TAM, this is a first comparative empirical analysis of consumer acceptance of SMS and NFC payments.

Regarding the SMS payment system, the most important variable on the *intention of use* is the *subjective norm*, followed by perceived *usefulness*, *attitude* and perceived *security*. Moreover, the *intention of use* was first determined by subjective norms, followed by perceived *usefulness*, *attitude* and perceived *security*.

The major variable regarding the *intention to use* in both payment systems is the *subjective norm*. The greater relevance of this factor is due to the current high interconnection between individuals on account of the rise of mobile communication technologies. This implies that the same consumers retain in high consideration the opinions of those that are really important to them.

Secondly, the *intention to use* is determined by the usefulness of the mobile payment system. This second element reinforces the proposal of the TAM, but distances itself from the values of *subjective norms*.

Attitude also becomes an essential determinant factor related to the question of the *intention to use* the new payment system. It expresses, in fact, a significant, positive and direct effect on the *intention to use*. Precisely the feelings or attitudes of the consumer to some extent also determine his predisposition to use the new technology. The strength of the effect on the *attitude to use* is lower, probably because the consumer, due to the novelty of the service, does not possess enough arguments or information to make a real judgment on future use. In spite of the lack of information, the consumer's attitude also has a decisive influence on the *intention to use* new mobile payment systems.

Finally, perceived *security* also bears a significant influence on the *intention to use.* Although this variable is rarely contemplated in research on the question of the acceptance of mobile technologies, in our work it is relevant due to the fact that consumers with a higher level of perceived *security* will show a higher propensity to accept new mobile payment systems.

On the other hand, it is worth noting that the differences detected between the two mobile payment systems reinforce the idea that the behavior of the consumer will differ

depending on the type of mobile payment system, as seen through the difference of intensity of the different *constructs*. In our case, we have observed differences in the levels between *subjective norms* and perceived *usefulness*, s*ubjective norms* and *intention to use*, perceived *usefulness* and *attitude*, perceived *ease of use* and perceived *usefulness*, and finally, perceived *ease of use* and *attitude*.

5.7 Limitations, conclusion and managerial implications

While our work focuses on a sampling of Spanish consumers, the goals of our research reside in analyzing precisely the *intention to use* and factors of use in developing markets with an incipient use of this technology. Nonetheless, the study can be applied to other countries in a situation similar to that of Spain with, possibly, differences of culture and even different levels of technology acceptance.

To confer greater external validity to our results, we could conduct a comparative study between different systems of payment, establishing a classification and a user profile for each type of technology, including other mobile technologies that are substituting payment by card. Finally, we could include in our study potential determining or modifying factors such as gender, age and even the grade of experience with similar payment devices.

Moreover, this study can impart a number of recommendations to companies interested in adopting mobile payment systems. It is evident to us, however, that the key to the diffusion of these new payment systems lies in the change of perspective of the general public regarding mobile payments and, more specifically, in convincing consumers to adjust their habit of paying with card and cash to paying by mobile phone. It is therefore essential that companies focus marketing strategies on informing consumers of the benefits of this service. It is also vital that companies interested in promoting these technologies take into account other factors that, despite playing a lesser role, are still important to the process of adoption of payment systems through mobile phones. These secondary factors are related to individual mobility, the quality of the specific payment system and even the elements of today's technological environment.

Once these first implications are overcome, we believe that it is vital for companies to sway subjective norms in the consumer's current technological environment chiefly by means of the virtual social media (Liébana-Cabanillas, 2012). This is currently a market that is beginning to be explored by many companies in order to secure an advantageous position and to exploit future synergies. In spite of this, it appears that NFC

users will be more receptive to the influences of this type of payment since it is considered it to be a "cooler" system. Marketing strategies that aim to influence and draw the attention of a large number of people should merchandize their products in films, television and other public events. These are starting points for the masses to recognize the benefits of these systems of payment.

Furthermore, the effect on the consumer's *attitude* toward the new payment systems involves, first, highlighting the need for an effort to ensure that they improve their perception and general opinion of new systems. For this reason, it is essential that companies publicize the benefits of these devices. It is, however, true that there are factors that favor companies that work with this new technology, such as the high rate of acceptance of mobile phones, as well as the increase of access to social networks through mobile internet. These trends provide access to shopping portals from any location at any time, exceeding the significant benefits of e-commerce itself. In our case we can observe a greater attitude or inclination on the part of consumers towards the NFC payment system.

On the other hand, usefulness is also a determining factor in the acceptance of these payment systems, as it reinforces the *intention to use*. Here, again, the usefulness of the NFC system exceeds that of the SMS. We encourage developers of mobile payments, especially those applying NFC, to focus their efforts on implementing user experience (UX) techniques and go beyond consumer expectations. They should seek not only to highlight their utility, but add value to their use. They must take into account that the UX represents an emerging change in the very concept of usability where the goal is not just to improve the performance of user interaction (effectiveness, efficiency and learning ease), but solve the strategic problem of the utility of the product and the psychological question of the gratification and pleasure of its use (D'Hertefelt, 2000).

Finally, perceived *security* is another fundamental factor in the acceptance by consumers of the new payment systems. Due to this perception, all the actors cited above must implement relevant security measures so as to reduce the consumer's perceived risk and focus the consumer's *attitude* towards the importance of the *usefulness* and, consequently, encourage a future *intention to use*. To carry this out companies must accentuate the notion of security of these payment systems through publicity, through seals of security quality and even making use of associated brands (VISA or PayPal, for example).

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CHAPTER 6

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ACCEPTANCE OF NFC TECHNOLOGY FOR MOBILE PAYMENTS:

A BRAZILIAN PERSPECTIVE

Iviane Ramos de Luna; Francisco Montoro-Ríos; Francisco Liébana-Cabanillas & João Gil de Luna

A worldwide growth of mobile technology has enabled many businesses to take advantage of it as a tool for sales. This study investigates the acceptance of Near Field Communication (NFC) technology for payment through mobile phones in Brazil so as to identify the factors that directly or indirectly influence its acceptance. Classic variables from the Technology Acceptance Model (TAM), as well as variables from other recent studies, were applied in this research. The model advanced has a predictive power of intention of 71% demonstrating its high predictive power regarding the acceptance NFC payment technology. The results show that attitude, personal innovation in Information Technology (IT) and perceived usefulness are determinants of the future intention to use this technology in Brazil. The paper concludes with a discussion of the main implications for corporate management and business development strategies to reinforce this type of business in light of new technical developments.

Keywords: Mobile payments, NFC, TAM, new technologies acceptance.

6.1 Introduction

To enhance the process of adoption and use of mobile payment services, it is important for both businesses and consumers to deepen their knowledge of these services. Based on this idea, the present study aims to investigate the acceptance of NFC (Near Field Communication) technology for mobile payments in Brazil so as to determine the factors that influence directly or indirectly its acceptance. After extensive research on the subject and experiencing the reality of mobile payments, we realized that there are no specific studies on NFC acceptance in Brazil. It is for this reason that this study is relevant both for Brazilian academia and the mobile industry.

It is obvious that mobile phone adoption is growing rapidly in Brazil as it is throughout the world. The many features included in these devices that help make daily life easier, more enjoyable and fun explains their widespread use (Luna, Montoro-Ríos, & Liébana-Cabanillas, 2016). There are now 7.4 billion mobile subscriptions worldwide and between 2015 and 2021. The IoT (*Internet of Things*) indicates a further increase in smartphone adoption that will reach 16 billion. This suggests that by 2018 smartphones will be the largest category of electronic connected devices (Ericsson, 2016).

Brazil is among the five countries in the world with the highest number of mobile phones. The others are China, India, Indonesia and the USA (Central Intelligence Agency [CIA], 2016). Brazil's mobile market potential is evident. It is the largest in Latin America and is the fourth largest in the world according to *GSMA Association* in its latest edition of the *Brazil Mobile Observatory* (2012). In fact, Brazil ended the first quarter of 2016 with a total of 257.81 million active mobile telephone lines (Agência Nacional de Telecomunicações [ANATEL], 2016), with about 23 million 4G mobile connections that by the end of 2016 is expected to reach 42 million, according to data from the GSMA Intelligence (2016).

This growth will be driven by increased penetration of smartphones in the country that will leap from 55% in 2015 to 62% by the end of 2016 despite pressure on prices in the macroeconomic environment. With consumers replacing their mobile phones with smartphones and consequently with the move towards faster networks (a significant increase in the new 4G connections is expected), it is assumed that total 3G and 4G mobile connections will attain 223 million by the end of 2016. This represents a growth of nearly 16 % compared to 2015 (GSMA Intelligence, 2016).

Specifically, in Brazil, smartphones have played an important role in the development of the market and have had a deep impact on consumer behavior. Of the

total smartphones users, 80% have searched for a product or service of interest, 41% have recommended or reviewed the company to others, and 55% have made purchases from an online or physical store (Google, 2012). The scenario indicates that the smartphone market is ~~already~~ huge, global and strategically important to all interested in monetizing digital content and distribution services and mobile marketing programs. In this sense, the scenario is favorable to mobile payments as it eliminates use of the physical wallet, replacing it with a single device, the smartphone.

Mobile payments allow consumers to eliminate or reduce the need of cash (Pham & Ho, 2015), offering convenience and speed (Teo, Tan, Ooi, Hew, & Yew, 2015), performance and secure transfer of information from the simple transaction to situations with high volume of payments such as restaurants or large retailers (Leong, Hew, Tan, & Ooi, 2013). Both business and consumers benefit from a considerable reduction in operating time, thus achieving clear benefits in productivity (Oliveira, Thomas, Baptista, & Campos, 2016), adding value to small and medium-sized businesses. For these reasons mobile payments have a large growth potential. Moreover, according to the survey conducted by the Statista corporation (2015), the global mobile payment revenues are expected to reach 721 billion USD in 2017 making it one of the most important means of conducting mobile financial transactions.

In recent years' consumers have used their smartphones as personal digital assistants and shopping devices. In the US, 79% of smartphone users are also mobile consumers, most often through by means of specific retail applications in stores such as Best Buy, Kohl or Macy's. Through mobile applications the shopper can check prices, discounts, additional information and reviews of products, compare product features, and ask opinions from friends (Kang, Mun, & Johnson, 2015; Kerviler, Demoulin, & Zidda, 2016).

On the other hand, smartphone manufacturers such as Apple, Samsung and Google have recently launched mobile payment services (Apple Pay, Samsung Pay and Android Pay) raising the awareness of customers about the options of m-payment (Kerviler et al., 2016). However, only half of the users actually buy with these devices (Emarketer, 2015) and only about 15% use m-payment regularly (First Annapolis, 2016). In this sense, mobile shopping seems to have a greater impact on traditional sales (in physical stores) than on mobile commerce sales (Groß, 2015; Kerviler et al., 2016).

The latest study by Accenture (2015) shows that consumers see themselves using less traditional means of payment and turning to digital payment in the future in spite of

the fact that it is not commonly used today. By the end of that decade, Accenture expects a significant increase in m-payments. However, entities involved in the commercialization of mobile payments still need to dedicate more effort to understand the consumer and how to manage the increase in an enduring way.

Currently, the development of applications and new business models related to m-commerce (mobile commerce) such as mobile payments is in full growth. There are many solutions in the market using different means and technologies. NFC technology, also called *contactless* payment, is a common factor among them. Payment methods developed by three of the world's major mobile technology industries (Apple Pay, Samsung Pay and Android Pay) are examples. Similarly, startups are also investing in this technology despite little success coupled with criticism as in the case of the Google Wallet app launched in 2011.

NFC technology has become one of the most promising technologies in recent years due to the business opportunities in its application for mobile phones and reliance on important features in the short term beyond the mobile payment (Luna et al., 2015). NFC could present traders with the means for its consumers to communicate directly with companies through products, applications or mobile payments. For example, when examining a NFC chip in a package, the client could send real-time information directly to the manufacturer, generating extremely valuable information since the technology allows discerning both what is happening with their products after they have leave the shelves and the buying habits of their customers (Simpson, 2015). It is for these reasons that we chose to study this technology.

Mobile payments in Brazil are still in the embryonic stage. This is understandable since the ecosystem of mobile payments requires the creation of accords between various players. It is essential to develop an interest and synergy between banks, technology businesses, credit card companies, telephone services, startups, governments, businesses, customers and other stakeholders.

Payment with mobiles is a relatively new area of research compared with other similar subjects such as online trading, *Internet banking* or *mobile banking*. Some authors consider that this is a subject that is in its infancy (Slade, Williams, & Dwivedi, 2013) in spite of the significant advances in recent years in this field (Dahlberg, Guo & Ondrus, 2015) Furthermore, many experts consider mobile payment as having the greatest potential in this sector ((Liébana-Cabanilla, Ramos-De-Luna, & Montoro-Ríos, 2015). Only a few studies of the subject have appeared in recent leading academic journals

(Slade, Williams, Dwivedi & Piercy, 2014; Luna et al., 2016, Oliveira et al., 2016). Yet they coincide on the need to develop a better understanding of the factors that determine mobile payment adoption.

The need to study mobile payments in Brazil has been noted in other research (Bourreau & Verdier, 2010) that compares the number of credit/debit cards with the number of mobile phones in developed and developing countries. The results reveal a larger amount of credit/debit cards than mobile phones in developed countries and the opposite in less developed countries. This therefore presents an interesting opportunity to promote mobile payment as an electronic payment solution to a population that does not benefit from banking services. In addition, access to, and use of new technologies is seen as essential in today's society because of the potential it offers to the world economy described as being based on directed knowledge and information (Duncombe & Boateng, 2009).

To achieve this goal, we carried out in section 2 a clarification of the technical concepts related to the technology. This is followed, in section 3, by a review of the main theories of acceptance/adoption of technological innovations and mobile payments, and a proposal of a model based on the theoretical review that attempts to explain by enunciating different hypotheses the process of acceptance of NFC technology. Section 4 presents the methodology, including the measurement instrument, the techniques to analyze the data and the sample profile. Section 5, by means of a structural equation model, estimates the adequacy of the theoretical model to explain the relationships between the different factors that, from the user point of view, influence the acceptance of NFC payment. Finally, section 6 lays out the findings of the study, including its limitations and advances future lines of research.

6.2 What is near field communication (NFC) technology?

NFC technology is a type of *contactless* technology that enables an instantaneous transmission of data by simply approaching a device a distance of less than 4 cm to a receiver (e.g. mobile phone). The potential of this type of contactless technology to improve commercial processes such as the speed of purchase, immediate product information, interactive ads, and the possibility of companies to perceive the shopping habits, etc., allows the technology to be considered a tool attractive for companies, customers, as well as for research.

One of the central elements of NFC mobile services is the question of security (ES), a "a secure microprocessor (a smart card chip) that includes a cryptographic processor to facilitate transaction authentication and security, and provide secure memory for storing payment applications (e.g., American Express, Discover, MasterCard, Visa and other payment applications). SEs can also support other types of secure transactions, such as transit payment and ticketing, building access, or secure identification" (Madureira, 2017, p. 133; Smart Card Alliance, 2011).

Although NFC technology was developed in 2004, it still today is going through experimental tests of acceptance by users. A number of projects designed for mobile payments using contactless technology have been carried out around the world with Europe as one of the leaders. Over the years the technology has been subject to a number of improvements especially after the creation of the NFC Forum. The first NFC payment service, Google Wallet, was launched in the United States towards the end of 2011. The same year, PayPal, a company of digital payments, sued Google for theft of trade secrets which resulted in a loss of credibility for Google. Nevertheless, the Google Wallet application registered 36,500 downloads by June 2016.

Since 2011, when the first payment service market was launched, NFC technology has gone through major changes to adapt to new environments and features, and repair the glitches in safety and performance (Brada & Brada, 2016). The scenario in which the technology operates also evolved allowing it to assume its place in the field granting consumers knowledge of its existence and its ease of use. NFC technology has been considered by certain authors as the future of mobile payment services (Ondrus & Pigneur, 2007; Luna et al., 2016; Morosan & Defranco, 2016). This is bolstered by the dramatic development in recent years of m-payment technology following the emergence and spread of a new set of mobile and smart devices that include a large number equipped with NFC technology (Oliveira et al., 2016).

In Brazil, 85% of points of sale devices (POS) are currently capable of receiving payment by means of devices equipped with NFC technology such as Apple Pay to be released in late 2016. Samsung Pay and Android Pay, its competitors, are also introducing the technology. Sciarrettta (2016) in the latest issue of Ciab FEBRABAN magazine notes that the latter two mobile payment systems are considered more user-friendly by financial institutions because they do not rely on the latest types of devices or apply charges for transactions. Banking institutions such as the Bank of Brazil, Caixa, Itaú, Bradesco, HSBC, Santander and Porto Seguro have announced a partnership with Samsung Pay in

Brazil. Banks are also dealing with Apple Pay to bring the service to the country but have not specified the state of the negotiations. Moreover, a popularization of mobile payments in the coming months is expected as consumers replace current mobile phones with newer smartphones (Sciarretta, 2016).

What is perceived is a scenario of mass development of mobile payments. Although this still depends on several factors the main factor at this stage is the acceptance of end-users (consumers and businesses). The advances are continuous and the parties interested in the development of this type of payment still seek ways to optimize the service in order to generate an increasingly effective model for financial transactions. Financial institutions are also constantly seeking to promote an online payment security leap in quality while technology companies are constantly exploring ways to develop an easier and faster use of this technology.

These facts reveal that although many consider that NFC's arrival is for the long-term, it is in fact now very real and close. This view of the future of payments shows the need for businesses, consumers, banks and other stakeholders to study mobile contactless payments and the factors that may influence the adoption of this new means of purchasing goods and services.

6.3 Literature review

The current work reviewed several studies regarding the adoption of information technology (IT), especially those related to adoption of mobile payments services and mobile technological innovations. Most of the research in these fields is based on use or future use of existing technologies. Yet NFC, the object of this study, despite being a mature technology, is not in use in Brazil. Taking this into consideration, the current study develops a model to measure the intention of future use based on existing literature.

The model starts from the assumption that the *Technology Acceptance Model* (TAM) designed by Davis (1989) provides a good base to explain the use of m-payments (Dahlberg, Mallat, & Oorni, 2003) and that the constructs the TAM are quite general and of universal use for different computer systems and different populations (Malhotra & Galletta, 1999). Moreover, this theory has been widely accepted and implemented in various investigations on the adoption of different technologies, including mobile technologies (Kim, Mirusmonov, & Lee, 2010; Lu, Yang, Chau, & Cao, 2011; Yang, Lu, Gupta, Caso, & Zhang, 2012). For these reasons, this work is based on the original TAM model by Davis (1989) in spite of not excluding other important factors from both classic

models and recently developed models that show a high amount of explained variance of intention to use technology.

In what refers to classic models, we have included the “subjective norms" of Fishbein and Ajzen (1975) from *Theory of Planned Behavior* (TPB), the *Theory of Reasoned Action* (TRA) by Ajzen (1991) and finally the *Theory of Acceptance Model 3* (TAM 3) by Venkatesh and Bala (2008) as determinants of attitude and intention to use a technology. We also included the "perceived compatibility" suggested in the *Innovation Diffusion Theory* (IDT) by Rogers (1983) as a determinant of attitude to the use of technology and predetermining its intended use.

Among the research centered specifically to mobile technologies is the work of Lu, Yao and Ye (2005) (2005) that sought to empirically identify factors driving to the adoption of Wireless Internet Via Mobile Technology (WIMT). This model states that the determining factors in the intention to adopt this type of service are its perceived usefulness and its perceived ease of use. These factors are, in turn, determined by social influences and personal innovation. It was therefore possible through this model to explain 57% of the explained variance of the intention to adopt the technology.

Schierz, Schilke and Wirtz (2010) also attempted to gain a better understanding of the determinants of acceptance of mobile payment services by consumers and the reasons why the service has not gained widespread use despite the fact that mobile technology has become so common in today's everyday life. The Schierz et al. (2010) model, although based on TAM, includes other variables that influence the attitude and intention to use mobile payments. These authors found a strong empirical support in the questions of compatibility, individual mobility and subjective norms. The Schierz et al. (2010) model was able to explain 84% of the attitude to use and 85% of the intention use of mobile payment demonstrating that the model brings together a set of important factors that could be used to explain the intention to adopt other types of mobile payments.

For these reasons the current work includes the three following variables that are equally important to study the acceptance of this technology to pay with mobile phones: a) "perceived security," b) "individual mobility," and c) "personal innovation in information technology." These are included in more recent models with significant explained variances (Lu et al., 2005; Shin, 2009; Lu et al., 2011; Kim et al., 2010; Yang et al., 2012). From these five constructs, plus the four proposed in the original TAM developed by Davis (1989), we propose a model contrasting 15 hypotheses with the

ultimate goal of explaining the intention of the Brazilian population to adopt the NFC mobile payment service.

6.4 Hypotheses

Following the example of Venkatesh and Davis (2000), we initiate the section of hypotheses with the core of the TAM model followed by additional constructs extending the original theory adapted to NFC technology. The discussing begins with the hypotheses related to the technology itself before presenting factors related to social context, as well as two factors characteristic of users.

An important dependent variable in studies based on the TAM is the intention to use (Van Der Heijden, 2003). This variable is also key in studies on the acceptance of mobile payments (Chen & Adams, 2005; Kim et al., 2010; Yang et al., 2012). This intention is defined as the probability that an individual will use a technology.

Several studies such as those of Chen and Adams (2005), Meharia (2012) and Schierz et al. (2010) based on the results garnered by Davis (1989) found that the main antecedent and key mediator of influence of the other variables on intention to use is the attitude of a person toward the use of a particular technology. That can be understood as the positive or negative assessment of the use of a technology held by a particular individual.

Since other studies focusing on mobile technologies have identified a positive relationship between attitude towards use and intention to use of certain technological innovations (Bigné-Alcañiz, Ruiz-Mafé, Aldás-Manzano, & Sanz-Blas, 2008; Lu, Yu, Liu, & Yao, 2003), this current study proposes a similar relation for the case of NFC mobile payment:

Hypothesis 1: The attitude towards the use of NFC technology for payment with a mobile phone determines the intention to use this type of payment.

The idea of ease of use refers to an individual's perception that using a particular system will not require effort to carry out a particular task (Davis, 1989). In this case, the perception refers to the ease of making a payment by means of NFC technology. Davis considered the ease of use as one of the attributes with the greatest influence on the adoption of new technologies. This influence is manifest through a double impact: one in the Attitude due to self-efficacy and instrumentality and the other in the usefulness, as in the case of the TAM.

The effect of ease of use over perceived usefulness has been shown in multiple studies applied to different contexts (Liébana-Cabanillas, Muñoz-Leiva, Ibáñez-Zapata, & Rey-Pino, 2012; Luna, 2012; Muñoz, Hernández-Méndez, & Sánchez-Fernández, 2012), as well as the relationship between ease of use with attitude (Chau & Lai, 2003; Hernández, 2010). Based on these arguments, we propose:

Hypothesis 2: The consumer's perceived ease of use of the NFC mobile payment system determines his/her attitude towards using this system.

Hypothesis 3: The consumer's perceived ease of use of the NFC mobile payment system determines his/her perceived usefulness of this means of payment.

The perceived usefulness is a fundamental antecedent to the attitude towards the use of a particular technology (Davis, 1989). Several studies over the years have also proved the importance of this construct for the study of technology acceptance (Chen & Adams, 2005; Yusta, Ruiz & Zarco, 2010; Meharia, 2012) which does not allow us to disregard it in the framework of the study of acceptance of NFC technology in payments with mobiles.

According to Rogers' (2003) theory of diffusion, users are only willing to accept the innovations if they offer a unique advantage over existing solutions. Recognizing that the proper perception of the utility of NFC technology to perform payments more effectively is critical to its acceptance, we propose the following hypothesis of this study:

Hypothesis 4: The consumer's perceived usefulness of NFC mobile payment positively determines his/her attitude towards the use of this type of payment system.

Subjective norms, also called social influences, are used in various models of acceptance of technology, as well as in their more recent adaptations (Fishbein & Ajzen, 1975; Venkatesh & Bala, 2008). According to Yang et al. (2012), the TRA and the TPB explain that the intention of an individual to adopt an innovation is not only determined by attitude, but also by subjective standards that make up the his/her values of conduct and standards.

This factor is defined as the degree to which an individual considers the opinion of other individuals close to him (family and friends) regarding to the adoption of a system or carrying out a certain action. (Fishbein & Ajzen, 1975; Venkatesh & Davis, 2000; Venkatesh & Bala, 2008).

This social construct consists of two basic sets of underlying factors. First is the opinions that the consumer has of people considered as a reference, and the second is the motivation of the person to behave in accordance with the wishes of the people or

reference groups (Herrero Crespo, García de Los Salmones, & Rodríguez Del Bosque, 2005; Davis, Bagozzi, & Warshaw, 1989). From this point of view, many authors identified a direct and positive link between subjective norms and ease of use (Lu et al., 2005; Bhatti, 2007), usefulness (Zhang, Yue, & Kong, 2011; Venkatesh & Davis, 2000; Taylor & Todd, 1995;) and intention of use (Shih & Fang, 2004; Shin, 2009; Glass & Li, 2010; Chung, Stoel, Xu & Ren, 2012;). Accordingly, we propose the following hypotheses:

Hypothesis 5: Subjective norms determine the consumer's intention to use the NFC mobile payment system in the near future.

Hypothesis 6: Subjective norms determine a consumer's perceived usefulness of the NFC mobile payment system.

Hypotheses 7: Subjective norms determine the perception of the ease of use of the NFC mobile payment system by the consumer.

A major concern both for business and consumers is payment security, especially when it comes to new means of purchasing products and services involving novel technology, as was once the case of the credit card and will possibly be the case of NFC.

Grassie (2007) states that safety must be a priority in order for NFC applications to be successfully adopted. When consumers evaluate the use of the consequences of a particular product, they not only evaluate the immediate consequences, but also the internal consequences which can often lead to conclusions of potential benefits or risks of a product (Cho, 2004). This can affect both the intention to use the NFC as well as the perception of its utility. Based on these arguments, we propose the following hypotheses:

Hypothesis 8: A consumer's perceived security of the NFC mobile payment system determines his/her intention to use it.

Hypothesis 9: A consumer's perceived security of the NFC mobile payment system determines his/her perceived usefulness of the system.

We can understand the compatibility as well as the degree to which technological innovation is perceived by potential users as consistent with their values, needs and past experiences (Rogers, 1983). This reveals the importance of this factor in this study as it combines technological innovation with values, behavioral patterns and consumer experiences. Tornatzky and Klein (1982) affirm that the compatibility perceived by a user is a fundamental feature leading to the acceptance of a particular technology such as the NFC. Recognizing the importance of this aspect, and considering that it is critical to

ascertain the degree of impact of this factor on the acceptance of the NFC system in Brazil, we have therefore included the following hypotheses in our model:

Hypothesis 10: A consumer's perceived compatibility determines his/her attitude towards the use of the NFC mobile payment system.

Hypothesis 11: A consumer's perceived compatibility determines his/her perceived usefulness of the NFC mobile payment system.

Given the great popularity of smartphones in the market, it is common to see people carrying out all sorts of activities with their devices. This leads to the belief that we possibly live in the times of "nomadicity" of computing and communication described by Kleinrock (1997) where a variety of portable devices allow people to be in touch with the world even when they are on the go without a fixed point to communicate or perform other activities.

Individual mobility, an idea brought up for the first time in the study of Schierz et al. (2010), is based on this concept of "nomadicity" because it refers to how a particular person desires to remain in contact and maintain activities from anywhere by means of the technology currently offered. This can vary greatly between individuals even with the widespread use of mobile devices. Based on these thoughts and following the results of the study of Schierz et al. (2010), we propose the following hypotheses:

Hypothesis 12: The consumer's individual mobility determines the perceived usefulness of the NFC mobile payment system.

Hypothesis 13: The consumer's individual mobility determines the attitude of using the NFC mobile payment system.

Hypothesis 14: The consumer's individual mobility determines the intention to use the NFC mobile payment system in the near future.

Considering that the NFC is an innovative technology for the mobile payment market that will become a worldwide trend in a few years, from the review the specialized literature, we believe it is important to consider the influence of the factor of *Personal Innovativeness in Information Technology (*PIIT) proposed by Agarwal and Prasad (1998) that has also been applied in other studies (Agarwal & Karahanna, 2000; Thatcher & Perrewe, 2002; Lewis, Agarwal, & Sambamurthy, 2003). In light of this trend, it gives prominence to the fact that the perception of the end user can vary according to different characteristics before the adoption of technology.

Agarwal and Prasad (1998) define this factor as the will of an individual to try all any of the information technology, conceived as a trait that is not influenced by

environmental or internal variables. For these reasons we consider relevant to determine the effect of this factor on the intention to use the NFC. This has proven effective in the study of Lu et al, (2005), as well as the perceived usefulness and ease of perceived use, as found in Yang et al. (2012). Given these reasons we propose the following hypotheses:

Hypothesis 15: The Personal Innovativeness in Information Technology (PIIT) of the consumer determines the perceived usefulness of the NFC mobile payment system.

Hypothesis 16: The Personal Innovativeness in Information Technology (PIIT) of the consumer determines the perceived ease of use the NFC mobile payment system.

Hypothesis 17: The Personal Innovativeness in Information Technology (PIIT) of the consumer determines the intention to use the NFC mobile payment system in the near future.

6.5 Methodology

In this section we present the details of the methodology applied to the research, the preparation of the measurement instrument, the procedure of collection of data, the characteristics of the sample and the techniques used for data analysis.

6.5.1 Measurement instrument

The items chosen in this study are founded on research carried out with the conceptual construction of each variable included in the proposed model in order to ensure the instrument's validity. Most of the items were originally developed in English so, for the needs of the study in Brazil, it was necessary to first translate them into Portuguese. In some cases, the wording was modified to adapt to the Brazilian context of the mobile payment NFC systems. Table 8 provides a list of the items and their references.

The self-administered questionnaire, available online, was subject to a series of preliminary tests. The link was available online between January 1 and April 10, 2013. It comprised 34 statements along with a seven-point Likert scale of responses with 1 corresponding to "strongly disagree" and 7 to "strongly agree". The questionnaire also included a filter question to detect the level of knowledge of NFC in Brazil since the technology is new. Individuals who responded (1) do not know it; (2) heard of, but do not know it or how it works; (3) heard of, mostly from the media; and (5) do not know / did not respond, were invited to view a video explaining the NFC payment system by mobile phone.

Table 15 - Questionnaire items			
Construct	Items		Autors
Attitude toward the use of NFC payment systems	ATU1	The use of NFC mobile payment is a good idea	Oh *et al*. (2003), van der Heijden (2003), Yang and Yoo (2004), Schierz *et al*. (2010)
	ATU2	The use of NFC mobile payment is convenient	
	ATU3	The use of NFC mobile payment is beneficial	
	ATU4	The use of NFC mobile payment is interesting	
Intention to use NFC payments systems	IU1	Given the opportunity, I will use a mobile NFC payment system	Davis (1989), Gefen *et al*. (2003), Venkatesh and Davis (2000), Schierz *et al*. (2010)
	IU2	I am likely to use a NFC payment system in the near future	
	IU3	I am open to using NFC mobile payment system in the near future	
	IU4	I intend to use an NFC mobile payment system when the opportunity arises	
Perceived usefulness of NFC payment systems	PU1	NFC mobile payment system is useful mode of payment	Bhattacherjee (2001), Devaraj *et al*. (2002), van der Heijden (2003), Schierz *et al*. (2010)
	PU2	Using NFC mobile payment makes the handling of payments easier	
	PU3	NFC mobile payment system allows quick use of mobile applications (for example, ticket purchases, and use of mobile coupons, etc.)	
	PU4	The use of the NFC mobile payment NFC will improve my decision making process as a consumer (e.g. flexibility, speed, etc.).	
Perceived ease of use of NFC payment systems	PEOU1	It is easy to become skillful at using NFC mobile payment system	Bhattacherjee (2001), Davis *et al*. (1989), Taylor and Todd (1995), Venkatesh and Davis (2000), Schierz *et al*. (2010)
	PEOU2	Interactions with NFC mobile payment system are clear and understandable	
	PEOU3	It is easy to follow all the steps to use NFC mobile payment system	
	PEOU4	It is easy to interact NFC mobile payment system	
Perceived security of NFC payment systems	PS1	The risk of an unauthorized party intervening in the payment process is low (PS1)	Luarn and Lin (2005), Parasuraman *et al*. (2005), Schierz *et al*. (2010)
	PS2	The risk of abuse of usage information (e.g., names of business partners, payment amount) is low when using NFC mobile payment system (PS2)	
	PS3	The risk of abuse of billing information (e.g., credit card number, bank account data) is low when using NFC mobile payment (PS3)	
	PS4	I would like that the NFC payment system is safe for my financial transactions.	

Perceived Compatibility in NFC payment systems	PC1	NFC mobile payment system use fits well in my lifestyle	Moore and Benbasat (1991), Plouffe *et al.* (2001), Schierz *et al.* (2010)
	PC2	NFC mobile payment use is consistent with the way I like to buy products and services	
	PC3	I would appreciate to use NFC payment system over other kinds payment systems (for example, cash or traditional credit cards.)	
Subjective Norms	SN1	People who are important to me would recommend using NFC mobile payment system	Taylor and Todd (1995), Venkatesh and Davis (2000), Schierz *et al.* (2010)
	SN2	People who are important to me view NFC mobile payment system as beneficial	
	SN3	People who are important to me think it is a good idea to use NFC mobile payment systems	
Individual Mobility	IM1	I could imagine having multiple jobs at a time	Schierz *et al.* (2010)
	IM2	I would like to be able to keep in touch everywhere I am	
	IM3	I would like to be able to coordinate my daily tasks everywhere I am	
	IM4	I would like to be able to coordinate my daily tasks anytime.	
Personal Innovativeness in Information Technology	PIIT1	If I find out about new information technology, I seek ways to experience it	Agarwal and Prasad (1998), Lu *et al.* (2005)
	PIIT2	I am usually one of the first among my colleagues/peers to explore new information technology	
	PIIT3	In general, I am reluctant to try new information technologies*	
	PIIT4	I like to test new information technologies	
* The item uses inverse scale			

The method of data collection applied in this study was considered appropriate since it provided a quantitative description of attitudes, experiences and opinions of a sample of mobile users in Brazil without the influence of an interviewer or being put under pressure. It therefore has a greater guarantee of preserving the anonymity and privacy, aspects that encourage more lucid and honest responses (Bowers, 1998; Viehland & Leong, 2007).

6.5.2 Data collection and the sample

The population from which to draw conclusions was defined as all individuals capable of using mobile phones in Brazil. One reason for this choice is due to the fact that the current number of individuals to that can carry out at least one NFC payment, besides

being very small, is, a priori, very difficult to identify. In addition, it is of interest to identify the acceptance of the NFC at this early stage (when most people are unaware of how to properly apply it) so as to yield a better idea of their intention of use.

The procedure chosen for this research was that of a snowball sampling (also called referral sampling) using researcher social networks as it was not possible to obtain a list of individuals with the characteristics mentioned above. The process was initiated in *Facebook* through invitations sent by private message or posted on bulletin boards with a brief explanation of the study and providing the link to the research. In addition, participants were asked to forward the invitation to others of their network, as recommended by Aaker, Kumar and Day (2010).

A total of 610 forms were collected at the deadline of the questionnaire. After the elimination of incomplete forms, a final sample consisted of 423 individuals spread across the 26 States and the Federal District of Brazil. Table 9 lists the socio-demographic characteristics of the respondents.

Table 16 - Socio-demographic characteristics of the sampling					
State	**fi**	**%**	**Gender**	**fi**	**%**
Acre	10	2.4	Male	235	55.6
Alagoas	8	1.9	Female	188	44.4
Amapá	8	1.9	Total	423	100
Amazonas	14	3.3			
Bahía	16	3.8	**Age range**	fi	%
Ceará	10	2.4	Less than 18	15	3.5
Distrito Federal	11	2.6	From 18 to 24	198	46.8
Espírito Santo	7	1.7	From 25 to 34	147	34.8
Goiás	50	11.8	From 35 to 44	28	6.6
Maranhão	7	1.7	From 45 to 54	23	5.4
Mato Grosso	4	0.9	More than 54	12	2.9
Mato Grosso do Sul	9	2.1	Total	423	100
Minas Gerais	11	2.6			
Paraná	17	4.0	**Education level**	fi	%
Paraíba	108	25.5	Primary and secondary school	30	7.1
Pará	2	0.5	University	277	65.5
Pernambuco	7	1.7	Post-graduate	116	27.4
Piauí	11	2.6	Total	423	100
Rio de Janeiro	9	2.1			
Rio Grande do Norte	18	4.3	**Knowledge of technology**	fi	%
Rio Grande do Sul	9	2.1	No knowledge	148	35.0
Rondônia	7	1.7	Heard of, but unaware of how it works	109	25.8
Roraima	1	0.2	Heard of basically through the media	140	33.1
Santa Catarina	21	5.0	Knows and used during a period of test.	18	4.3
Sergipe	3	0.7	Knows and uses on an everyday basis	8	1.9
São Paulo	42	9.9	TOTAL	423	100
Tocantins	3	0.7			
Total	423	100			

Before proceeding with the analysis of the data, and in the interest in the study, 6.2% of the sample was excluded as it comprised individuals already possessing NFC experience that would be biased.

6.5.3 Data analysis technique

The main technique used to prove the hypotheses formulated in this study was that of the Structural Equation Model using Amos 21 and SPSS 20 software from the IBM SPSS *Statistics* package.

6.6 Data analysis and results

The first step of the procedure was to evaluate the online form's variances (R^2). Secondly, as recommended by the literature, items with variance of less than 0.5 were singled out and excluded (Martínez, 2012). These were: SP4 (0.06) of the construct "perceived security;" UP4 (0.45) of the construct "perceived usefulness;" MI1 (0.21) of the construct "individual mobility;" PIIT2 (0.37) and PIIT3 (0.05) of the construct regarding "personal innovation."

6.6.1 Composite reliability and Variance Extracted

To ensure that the variables that make up each factor were internally consistent, we tested the internal consistency with Cronbach's Alpha Test that revealed all values to be greater than 0.7, the limit suggested by the literature (Nunnally, 1978). Furthermore, a Confirmatory Factor Analysis was carried out to establish the convergent and divergent validity of the scales.

The reliability of the scale can be evaluated from a series of indicators gleaned form the confirmatory analysis. Hence the values of the composite reliability (CR) and Average Variance Extracted (AVE) are in accordance to the requirements in the literature (Martínez, 2012) as at 0.7 and 0.5 respectively they exceed the reference threshold (Table 10).

Table 17 - Analysis of the confidence and validity of the scales

From	To	Standard Coefficient (SC)	Cronbach's Alpha	CR	AVE
Perceived compatibility	PC1	0.770	0.886	0.89	0.74
	PC2	0.903			
	PC3	0.898			
Perceived security	PS1	0.847	0.917	0.92	0.79
	PS2	0.934			
	PS3	0.887			
Perceived usefulness	PU1	0.819	0.846	0.84	0.64
	PU2	0.767			
	PU3	0.809			
Perceived ease of use	PEOU1	0.756	0.915	0.92	0.74
	PEOU2	0.839			
	PEOU3	0.918			
	PEOU4	0.915			
Individual mobility	IM2	0.783	0.887	0.89	0.74
	IM3	0.945			
	IM4	0.846			
Attitude toward the use	ATU1	0.832	0.912	0.91	0.72
	ATU2	0.854			
	ATU3	0.866			
	ATU4	0.833			
Subjective norms	SN1	0.866	0.938	0.94	0.84
	SN2	0.947			
	SN3	0.932			
Intention of use	IU1	0.874	0.939	0.94	0.80
	IU2	0.835			
	IU3	0.940			
	IU4	0.921			
Individual innovation in IT	PIIT1	0.795	0.795	0.76	0.62
	PIIT4	0.776			

With respect to the discriminant validity, it was shown that the variance was significantly different from zero and that the correlations between each pair of scales did not exceed 0.9, as recommended by various authors (Hair, Anderson, Tatham & William, 1995; Martínez, 2012).

The analyses of the sample's asymmetry and kurtoses found that it does not follow a normal distribution (Mardia's coefficient = 401.15; CR = 94.25). Therefore, following the recommendations of Hair et al. (1995), we carried out the most appropriate estimation procedure using the maximum robust likelihood method or *bootstrap* technique (2,000 replicates). In Bootstrap technique we use the p-value adjusted by the Bollen-Stine

method, testing the null hypothesis to determine if the model is correct. This resampling technique corrects the construct's standard of error.

6.6.2 Structural model

The structural model used in this study was verified through the structural model global adjustment goodness of fit indicators. These proved satisfactory as they had values acceptable according to those recommended by the literature (Bollen, 1989; Lai & Li, 2005) both in absolute measures of adjustment as measured in the incremental adjustment model (X^2 = 767.228 gl = 350; RMSEA = 0.055; RFI = 0.913; GFI = 0.887; AGFI = 0.859; NFI= 0.925; CFI = 0.958; IFI = 0.958).

The GFI index, in turn, is a very sensitive index that can vary according to the conditions of the sample. For this reason, it has become less popular in recent years. When there is a large degree of freedom in relation to the size of the sample, the GFI shows a downward skewing (Sharma, Mukherjee, Kumar, & Dillon, 2005). Therefore, although the GFI index did not meet the recommended minimum values, the discrepancy represented by the amount of 0.013 lead us to believe that the adjustment model was reasonably adequate to evaluate the result to the structural model.

6.6.3 Hypothesis Test

The testing of the hypotheses reveals that the ratios of the significant trajectories appear to support the model, in spite that not all relations obtained empirical support. Figure 5 and Table 11 briefly resume the results of the hypotheses testing.

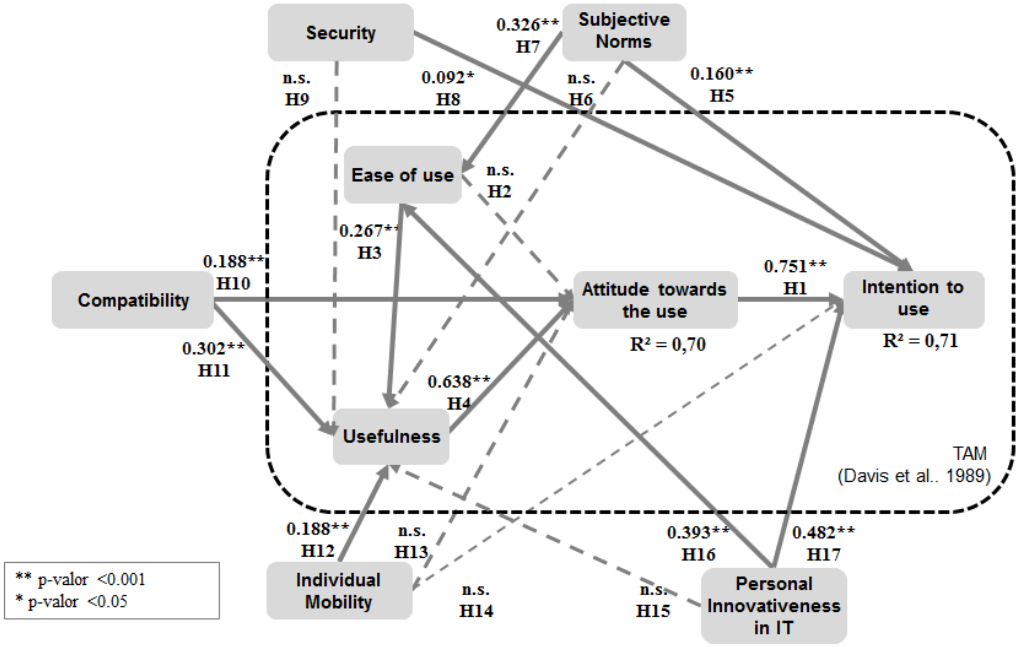

Figure 25 - Final model of NFC mobile payment system acceptance

Source: Authors

Table 18 - Hypotheses test

Variable			Hypothesis	Estimation	P-value	Result
Attitude toward the use (ATU)	→	IU	H1	0.736	<0.001	Supported
Perceived Ease of Use (PEOU)	→	ATU	H2	0.073	0.141	Rejected
		PU	H3	0.286	<0.001	Supported
Perceived Usefulness (PU)	→	ATU	H4	0.584	<0.001	Supported
Subjective norms (SN)	→	IU	H5	0.156	≤0.001	Supported
		PU	H6	0.037	0.372	Rejected
		PEOU	H7	0.313	<0.001	Supported
Perceived Security (PS)	→	IU	H8	0.087	0.021	Supported
		PU	H9	-0.016	0.604	Rejected
Perceived Compatibility (PC)	→	ATU	H10	0.189	<0.001	Supported
		PU	H11	0.284	<0.001	Supported
Individual Mobility (IM)	→	PU	H12	0.162	0.002	Supported
		ATU	H13	0.045	0.321	Rejected
		IU	H14	-0.130	0.051	Rejected
Personal Innovativeness in IT (PIIT)	→	PU	H15	-0.063	0.412	Rejected
		PEOU	H16	0.393	<0.001	Supported
		IU	H17	0.503	<0.001	Supported

The values allow us to determine that the attitude to the use of NFC payment in Brazil positively determines the intention of use ($\beta = 0.736$, $p < 0.001$) supporting hypothesis 1 (H1). This confirms the results of previous studies on the acceptance of technology (Lu et al., 2003; Chen & Adams, 2005; Bigné-Alcañiz et al., 2008; Kim et al., 2010; Yang et al., 2012).

The relationship between perceived ease of use and the attitude to use did not receive empirical support which allows us to state that perceived ease of use of NFC technology does not positively determine the attitude to use as proposed in H2 ($\beta = 0.073$; $p = 0.141$). The perception of ease of use, in turn, positively determines the perception of the usefulness of the technology ($\beta = 0.286$, $p < 0.001$) as proposed in H3.

Although the results exclude the possibility that the ease of use positively determines the attitude of use (H2) and refute the results advocated by Davis et al. (1989) in the Technology Acceptance Model (TAM), H4 does have empirical support that allows us to state that the perceived usefulness positively determines the attitude of use of NFC ($\beta = 0.584$, $p < 0.001$), bolstering the TAM proposition by Davis (1989).

With regard to subjective standards, the findings show that they positively determine both the intention to use NFC as proposed in H5 ($\beta = 0.156$, $p \leq 0.001$) and as in the case of ease of use as proposed in H7 ($\beta = 0.313$, $p < 0.001$). Yet it does not support Hypothesis 6 ($\beta = 0.037$, $p = 0.372$) suggesting that subjective norms do not positively determine the perceived usefulness of this technology.

The relationship proposed by H8 between the perception of security of the NFC and the intention to use it was supported ($\beta = 0.087$; $p = 0.021$) as suggested by Grassie (2007). Meanwhile the idea proposed in H9 that perceived security would positively affect the perceived utility did not receive empirical support ($\beta = - 0.016$, $p = 0.604$). Hence, the perception of security does not influence the perceived usefulness of the payment system in question.

The compatibility perceived by future users proved to be a relevant factor for the acceptance of the NFC payment system as the results show that this factor has a positive effect on both the attitude to use ($\beta = 0.189$, $p < 0.001$) and the perceived usefulness ($\beta = 0.284$, $p < 0.001$). These relations are also respectively proposed in Hypotheses 10 and 11.

Hypothesis 12, which states that individual mobility positively determines the value perceived by the individual, obtained empirical support ($\beta = 0.162$; $p = 0.002$). Yet H14, that states that such mobility positively determines the intended use of the NFC, did

not receive empirical support (β = - 0.130, p = 0.051). Neither did H13 stating that individual mobility determines the attitude to use of NFC payments (β = 0.045; p = 0.321).

The findings do not show that personal innovation in IT (PIIT) determines the perception of utility of the future user (β = -0.063; p = 0.412) as advanced in H15, but positively determines the perceived ease of use (β = 0.393; p <0.001) proposed in H16, as well as the intention to use the NFC payment system in the short term (β = 0.503, p <0.001) proposed in H17. This shows that this is also a factor that directly influences the intention to use and is of great importance to the introduction of this new payment tool on the market.

6.7 Conclusions

This study analyzes the acceptance by consumers of the NFC mobile payment system. This is carried out from a behavioral model that includes determining factors for the acceptance of technology of which the main factor of acceptance is the intention of use. In this sense the model proposed in this paper for NFC payment use has a predictive power of 71% which shows that it includes earlier items with a great predictive power of NFC acceptance since its values are those of other models of acceptance of similar technologies (Lu et al., 2011; Lu et al., 2005; Yang et al., 2012).

As to future use of NFC technology for payments, we found that the variables with the greatest influence on the intention to use were the *Attitude to use* at 74%, *Personal Innovation in IT* at 56% followed by *Perceived Usefulness* at 43%. Attitude has a significant positive and direct effect on intention to use. The power of attitude is notorious probably because users facing new technologies usually demonstrate curiosity and are predisposed to their acceptance.

The last two aspects mentioned above are relevant because new technologies, especially those linked to the customer's finances, will be adopted in principle by individuals who are open to new technologies and technological change, and therefore more adapted to accept them. Furthermore, if an innovation is also viewed as useful, its adoption will be easier. In the case of NFC payment, the combination of Personal Innovation and Perceived Usefulness by the future user is ~~shown~~ proven to be a winning combination for the adoption in Brazil at the moment of its introduction.

Despite having a smaller effect on the intention of use, perceived compatibility and subjective standards are also important factors in the adoption of the NFC payment system as they have an influence of 26% and 23%, respectively, on the intention of use.

It is essential for this type of technology, especially in the phase of introduction to the market, to be compatible with people's lives and that people recognize this compatibility. Subjective norms, in turn, are reflected in the current high interconnection between individuals stemming from both the rapid development of mobile communication technologies and the widespread use of virtual social networks. This implies that users take into account the opinions of others important to them.

Finally, the perceived ease of use also has a significant effect (18%) on intention to use and, to a lesser extent, on perceived security (8%). In fact, the notion of security is seldom considered among studies of the acceptance of mobile technologies. In the current study it resulted relevant mainly because it is a financial tool of users with a greater perceived level of security who have a greater propensity to accept new contactless mobile payment systems.

The relationship between individual mobility and intention of use revealed a small but significant negative value (-2.7%). This is probably the result of the high degree of mobility of the sampled population and that the intention of use of the tool does not depend on this factor, but rather on attitude, personal innovation and perceived usefulness. Furthermore, since the expense of mobile phones in Brazil is very high, users are accustomed to the use of mobile technologies and initially do not value this advantage.

6.7.1 Academic contributions and future lines of research

Although several studies on the acceptance of mobile payments and mobile technology have been published, the current paper is one of the first empirical works on the determinants of acceptance of the NFC payment system from a Brazilian perspective. Besides the general thoughts laid out in the preceding paragraphs, it is our hope that the current research will serve as a starting point, in particular in Brazil, for future empirical and conceptual studies on the acceptance of NFC technology or on other contactless mobile payment systems and technologies.

We propose that future research in Brazil also include other variables that are essential to the process of adopting new technologies such as the experience with credit card payments or other mobile payment systems. We also encourage other researchers to use a more representative sample so as to draw a profile of the Brazilian population regarding the intention to use of this type of payment technology.

Taking into account that growth in the use of NFC technology throughout the world is a reality and that our study is limited to a Brazilian sample, it would be interesting to compare the conceptual model of the current research with a sample from other specific countries or regions so as to explore the effects of cultural differences in the process of adoption of the NFC payment system.

6.7.2 Implications for professionals and businesses

The results of this exclusively Brazilian sample are of interest to businesses and other stakeholders in the Brazilian market that aim to promote NFC technology or payment by mobile phone using Brazilian technology. Companies that develop solutions for electronic payment, as well as businesses aiming at expanding ways for customers to pay for goods and services, can draw valuable information from this work to expand adoption of contactless mobile payment systems, in particular those equipped with NFC technology.

Although the key, in our opinion, to the adoption of such an innovative means of payment resides in a change of mentality, specifically a change from the practice of credit card and cash use to mobile phone payments, it is important to bear in mind that mobile payments require a complex web of relationships between a wide number of actors so as to offer financial services to a needy part of the population. At the same time the change will require strong government regulation (Diniz, De Albuquerque & Cernev, 2011).

The actors interested in popularizing NFC payment in Brazil must do their part while heeding to other, less significant, factors that are, nonetheless, central to the process of adoption of payment with mobiles. This is the case of the factors of ease of use and security, or even, as suggested by Dahlberg et al., (2008), of the very elements of the current technological environment.

We believe, considering the current state of the NFC payment market in Brazil, that it is advisable that companies should first be alerted to the assessments of future use of NFC payment by consumers. The current study indicates that these initial assessments are positive and affect directly the intention to use which will lead to use in the short term.

Focusing on users that are more familiar with new technologies and instruct them on the great utility of the NFC payment system is also an important piece of advice for those interested in encouraging the adoption of this tool. Users who enjoy testing new

technologies can be a great means of spreading this system in the market. Revealing the utility of this payment tool should take on a role equal to that of incentives for its use.

It is important to emphasize that what is critical to the success of adoption of mobile contactless payments, especially those using technologies like NFC, is the use of marketing tools to create strategic campaigns aimed to educate users on the utility of this type of payment. The campaigns should also focus on demonstrating how the new system is compatible with their lives. It should also make plain that the tool is safe for financial transactions by displaying the security measures that include security seals or even links with renowned brands of financial security such as, for example, Visa or PayPal.

On the other hand, the effects of subjective norms on the intention of use also cannot be discarded. This work advances that businesses should seek to draw the most out of both virtual and real social networks to encourage information and thereby seek to promote all the benefits of this electronic means of payment.

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CHAPTER 7

EXPLORING THE EFFECTS OF MOBILE SERVICES ON MOBILE PAYMENTS ADOPTION

Iviane Ramos de Luna & Key Pousttchi

This study seeks both to analyze the offer of 10 additional mobile services as a means of leverage favoring adoption of m-payments. The study also explores the differences between levels of Personal Innovativeness on the intention to use m-payments when offered in company of additional services. A model of structural equations was therefore developed based on specialized literature on adopting new technologies and mobile services. The data was collected in Germany and the survey yielded a valid sampling of 2210 cases. The main findings suggest that the offer of six of the mobile services positively affect the intention to use (IU) m-payments, while four positively affect the behavioral intention of use (BI). The additional services of Couponing and Ticketing are the most significant in IU, while Loyalty Program and Entertainment are the most significant in BI. The findings also reveal that individuals with lower levels of Personal Innovativeness are more motivated than those with higher levels to adopt m-payments when offered with additional services. The implications of this study indicate the importance of exploring m-payments from a new perspective, offering not only a new payment method but an integrated mobile services platform so as to, through data-based marketing, develop new revenue streams for both payment service providers and merchants generating additional value for future users.

Keywords: mobile payments, mobile services, mobile marketing, payment adoption, intention to use.

7.1 Introduction

The widespread growth of mobile phones is among a great number of features that help make daily life easier, more pleasurable and more entertaining. One of the consequences of the extensive adoption of these features is the constant increase of influence of information technology on traditional retailers facilitating and maximizing commercial processes, providing better and more personalized customer services resulting in increased in sales.

In light of this trend, most technology companies are focusing their efforts on increasing the number of mobile services, including mobile payment systems (Luna, Montoro-Ríos, & Liébana-Cabanillas, 2015). The current paper defines mobile payment (m-payment) as a procedure in which the client reverts to mobile communication techniques with mobile devices to initiate, authorize and complete payment (Pousttchi, 2008). Mobile devices serve to carry out both proximity and remote payments and offer the opportunity to generate personalized customer data for data-driven marketing (Pousttchi & Hufenbach, 2014).

The success of mobile Information Systems (IS) presents a number of challenges (Gebauer, Shaw, & Gribbins, 2010) with user adoption among the greatest. Although the services are innovative and interesting tools for both retailers and customers, the prevalence of m-payments and other mobile services depends on technological developments and improvements of usability, as well as user adoption. Therefore, the success of any electronic offer is not an inevitable result of its mere existence. Users, in fact, need to recognize the benefits of these technologies over their conventional counterparts (Pousttchi, Turowski, & Weizmann, 2003).

Studies in mobile commerce indicate a generalized interest among consumers in mobile services such as, for example, Mobile Tickets (Di Pietro, Mugion, Mattia, Renzi, & Toni, 2015), Social Networks (Liébana-Cabanillas, Herrera, & Guillén, 2016); Personal Information and Personalized Marketing (Eastin, Brinson, Doorey, & Wilcox, 2016); Loyalty Programs (Lim & Lee, 2015), Peer-to-peer Payments (Mallat, 2007), etc. Yet little research has explored the question of the influence of mobile services on m-payment adoption. Moreover, according to Rogers (2003), when considering the technology diffusion process, there are certain segments of the population that are more prone to use such technology before others. Roger's Diffusion of Innovations Theory states that there are five categories of adopters: innovators (2,5%), early adopters (13.5%), early majority (34%), late majority (34%) and laggards (16%). Each category retains the

behavioral characteristics of its individuals, yet the willingness to test and use new technologies seems to play a crucial role in its success. Furthermore, an alternative way of viewing these categories is that the first of the three comprise individuals who are more open to new technologies as opposed to the last two. Although there are few studies on the influence of personal innovativeness on the intention to use technological innovations, we believe it is important to deepen knowledge in this area and better understand the role this factor plays in m-payment adoption, especially in the framework of additional m-payment services.

Considering the issues mentioned above, this paper aims to answer the following questions: "How additional mobile services can increase the adoption of m-payments?" and "What is the role of personal innovativeness on adoption of m-payments when offered additional mobile services?" In order to analyze the impact of the mobile services and the importance of the factor of personal innovativeness on m-payment adoption, the current study applies an empirical approach including an analysis of the previous questions related to behavioral intention, intention to use solely the m-payment and the interest in using additional m-payment services as antecedents of intention to use m-payment with the condition of the offer of additional mobile services. This is followed by an analysis of how different levels of personal innovativeness affect the behavioral intention to use m-payments. This paper therefore contributes to discerning how to accelerate m-payment diffusion by combining the strategic and competitive advantages of additional mobile services and data-driven marketing.

The first section presents the current scenario of m-payments, the study problem and its objectives. Section 2 follows with the theoretical background introducing the variables and the model to be tested. Section 3 explains the research method and measures applied to the empirical study. Section 4 elaborates the specifications of the analysis of the data and the results. Section 5 concludes the paper by drawing together the study's theoretical and managerial implications, its limitations and suggestions for future lines of research.

7.2 Theoretical Background

This section describes the research framework of m-payment adoption based on innovation adoption literature by focusing initially on the role of additional mobile services combined with m-payments, on Intention to Use m-payments (IU), on the interest in using additional m-payment services, on the Behavioral Intention to use m-payments

(BI) and subsequently analyze the role of the level of personal innovativeness in the decision making process.

7.2.1 Additional mobile services combined with m-payments

During the last decade many researchers have analyzed different types of mobile services: Contactless Payments (Pousttchi, 2008), Location-Based Services (LBS) (Dhar & Varshney, 2001), Mobile Social Media (Kaplan, 2012), Augmented Reality (Guven, Oda, Podlaseck, Stavropoulos, Kolluri, & Pingali, 2009), Mobile Ticketing and Parking (Mallat Rossi, Tuunainen, & Öörni, 2009), Mobile Marketing (Palka, Pousttchi, & Wiedemann, 2009; Shankar, Venkatesh, Hofacker, & Naik, 2010), Mobile Loyalty (Mann & Prein, 2010) and Mobile Couponing (Banerjee & Yancey, 2010). Nevertheless, there is no specific research on the impact of the consumer interest in using additional or multiple mobile services on m-payment adoption.

The Pousttchi & Hufenbach (2014) study of mobile commerce services identified 12 categories designated as Building Blocks (BB). These include m-payment service and another 11 different mobile services. The current research took into account 10 of the 11 categories that potentially combine with m-payments services. Only one of the services suggested by Pousttchi & Hufenbach was sidestepped in this study: Mobile Virtual Network Operators (MVNO). This item refers to companies that sell mobile communications services (voice or data) under their brand without owning their own mobile network license (Pousttchi & Hufenbach, 2009). The exclusion of this service is because the present study focuses on mobile services combined with mobile payments offered by retailers and MVNO is has few links with this payment method.

The 10 services included in this study that can be combined with m-payment are defined in the following manner (Pousttchi & Hufenbach, 2014):

Mobile Couponing (CO) is the process of sending, receiving, forwarding, and redeeming a digital coupon by mobile devices. Mobile coupons have shown an increase in sales as their main objective is triggered by price reductions offered in the form of money-savings coupons, add-ons, or other values (Dickinger & Kleijnen, 2008). Companies use m-coupons to improve company-consumer relationships and generate additional sales and recommendations.

Mobile Lists (SL) consist of wish, gift, product, or shopping lists that can be created, approved, and forwarded by customers via mobile devices. This is an interesting

tool to improve sales that uses information about customer desires and offers recommendations for cross-selling and up-selling, offering discounts, or even making a promotional gift based on listed items.

Mobile Product Information (PR) is a mobile service that provides customers with information about products and brands (e.g. ingredients, potential allergy triggers, price, quality labels, manufacturer, or details about the manufacturing process). Retailers can combine product information systems with advertisements of related or additional products, and therefore learn more about customer motives when shopping.

Mobile Entertainment (EN) is defined as any type of leisure activity which interacts with service providers, including mobile services for amusement and raffles. The capacity to help kill time is one of the most important drivers for the use of mobile services (Pousttchi & Goeke, 2011). This service requires retailers to (1) attention paid to aesthetic design and, (2) when appropriate, to provide (data-generating) applications that help consumers kill time so as to subsequently retain them as customers by means of "gamification" in all types of mobile applications.

Mobile Social Media (SM) is defined as a platform "... that allows individuals to construct a public or semi-public profile, articulate a list of other users with whom they share a connection, and view and traverse their list of connections and those made by others within the system" (Boyd & Ellison, 2008). These platforms enable consumers to discuss and recommend products and businesses to develop marketing campaigns via mobile viral marketing (Pousttchi & Hufenbach, 2014). Mobile viral marketing is a form of distribution or communication transmitted by customers via mobile devices to other potential customers encouraging them to continue transmitting the content (Palka *et al.*, 2009).

Personalized Information (PI), according to Pousttchi & Hufenbach (2014: 27), "... is perceived as valuable by customers and even has the potential for forwarding, which again generates additional information about forwarding and receiving customers." These authors suggest that personalized marketing is a type of customer-specific communication based on purchase and interaction history, other customer data (such as preferences, recommendations or ratings), and technical data from the network, device, operation system, browser, or other applications.

Mobile Ticketing (TI) is the service permitting customers to order, pay, obtain and/or validate tickets using mobile phones or other mobile devices. The process comprises sending, receiving, and forwarding mobile tickets, including coupons or

banners. The advantages of mobile ticketing include a reduction of production and distribution costs (as compared to traditional paper-based channels) and an increase in customer convenience by providing new and simple ways to purchase tickets. Moreover, often purchase and payment is directly integrated in the ticketing process so the retailers can use mobile ticketing to send customers a free mobile parking or public transport ticket when, for example, checking out of the store.

Location-Based Services (LB) deliver user value-added information or services based on the user's location provided by the positioning technologies incorporated in mobile devices (Ferreira & Ramos, 2014). Retailers can use this tool to send, for example, mobile coupons or personalized information to their customers when they are in the vicinity of a business. This type of marketing increases purchase probability (Drossos, Giaglis, Lekakos, Kokkinaki, & Stavraki, 2007), as well as positive attitudes toward advertisements (Beneke, Cumming, Stevens, & Versfeld, 2010).

Mobile Ratings (RA) are subjective evaluations of objects (e.g. products, services, or mobile marketing campaigns) by customers via mobile devices. A rating might range from a simple overall grade or a complex field report with pictures and text. Based on the ratings, retailers can interact with customers, analyze service quality, and improve services and products.

Loyalty Programs (LO) are designed to encourage customer fidelity through the purchase of a particular product or service. The goal of these programs is generally to retain a higher number of consumers in profitable sectors by generating an increased sense of satisfaction and value (Bolton, Kannan, & Bramlett, 2000). Its full potential is attained by combination with m-payments, recommendations and ratings.

The categories of the 10 additional m-payment services defined above are summarized in Figure 6.

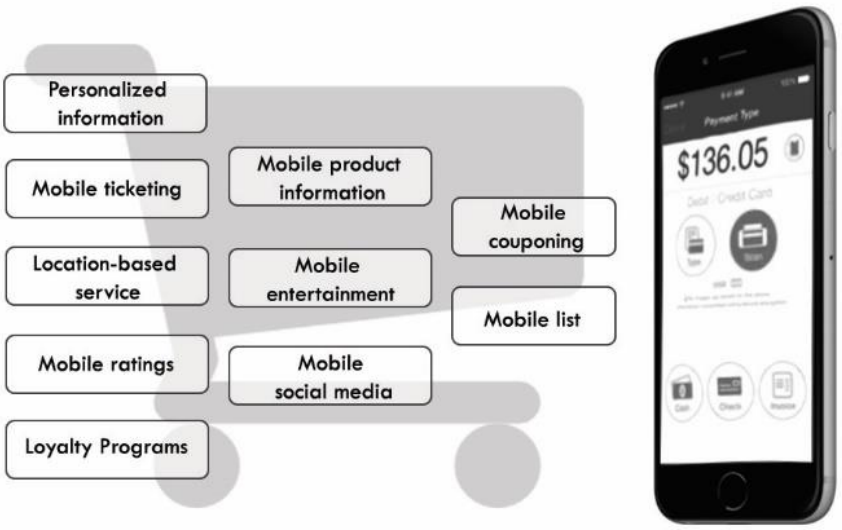

Figure 26 - Additional M-payment services

Source: Adapted from Pousttchi & Hufenbach (2014)

7.2.2 The interest in using additional m-payment services

This research focuses on the impact of additional m-payment ~~s~~ services on the conditioned intention to use m-payments. Based on previous studies, we identified evidence allowing the formulation of hypotheses about the role of consumer interest in using additional m-payment services as a determinant of the intention and the behavioral intention to use m-payment technology.

According to the Technology Acceptance Model (TAM), the main antecedents of intention to use are the attitude toward a technology (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989) and the degree to which the technology is positively or negatively valued by an individual. The positive relationship between attitude toward using a particular technology and intention to use the technology is detailed in a number of studies (Yang & Yoo, 2004).

The concept of attitude toward usage advanced by Davis (1989), and widely referred to in the literature on the intention to use various technologies, includes an item which allows users to indicate their level of interest in using a particular technology (Chen & Adams, 2005; Meharia, 2012; Schierz, Schilke, & Wirtz, 2010). As in a recent study applying only the level of interest to use to analyze the increase in future use of a particular medical procedure (Durante & Woodhams, 2017), our study postulates that the

interest in using a particular additional mobile service to m-payment can positively affect the decision to adopt m-payment services.

Furthermore, the results of an experiment carried out in Portugal with Ticketing and Couponing services integrated into an m-payment tool suggests that merging these features directly into the payment process is highly appreciated and clearly a factor leading to m-payment adoption (Rodrigues, José, Coelho, Melro, Ferreira, Monteiro, & Ribeiro, 2014). This reveals the importance of offering more than simply a new means of making payments. These mobile services are specified in section 2.5.

Hence the interest in using an additional service can be defined as the desire to get involved or to discover more about the use of mobile services if they are integrated into the m-payment service. The suppositions developed in this context are therefore based on the idea that interest in using additional m-payments services will positively affect the Intention to Use (IU) and Behavioral Intention to use (BI) m-payment.

7.2.3 Intention to Use M-Payment and Behavioral Intention

The market success of a particular technology depends of consumer's adoption, or, according with the Theory of Reasoned Action (TRA), the intention to use a particular technology. The present study therefore begins by defining the meaning of Intention and Behavior according to the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980) and the Theory of Planned Behavior (TPB) (Ajzen, 1991), premises that are widely accepted as the main theoretical framework for understanding and explaining adoption and usage behavior of various information technologies.

This is based on the supposition that intentions, in terms of seeking rather than actually carrying out a behavior, reflect the motivational factors that influence a behavior and are indications of the difficulties individuals are willing to face and how much effort they are willing to invest in undertaking a behavior (Fishbein & Ajzen, 1975; Ajzen, 1991).

Behavioral intention, in turn, can link the performance of a conduct only if the behavior in question is volitional, i.e. if the person is in the capacity to decide whether or not to carry out the behavior (Di Pietro *et al*., 2015). Although some behaviors may duly meet this requirement, most also depend to some extent on non-motivational factors such as the availability of the opportunities and resources such as time, money, skills and the cooperation of others (Ajzen, 1985). According to the Theory of Planned Behavior,

behavior is a function combining intentions and perceived behavior control. According to these theories, intention to act is considered an immediate antecedent of behavior (Davis *et al*., 1989).

With the advances of theoretical perspectives in this area that offer a better understanding of the determinants of the use of new technologies, it is assumed that the intention to use m-payment can be explained from different approaches (Junadi & Sfenrianto, 2015).

Both intention and behavior are important variables referred to in different studies regarding e-commerce adoption (Loiacono, Watson, & Goodhue, 2007), as well as factors serving to predict behaviors such as those of making online purchases (Van der Heijden, Verhagen, & Creemers, 2003), the intention to use a website (Gefen, Karahanna, & Straub, 2003; Van der Heijden, 2004), and mobile payment acceptance (Di Pietro et al., 2015; Schierz et al., 2010).

Meanwhile, it is worrisome that many m-payment apps are available for different mobile operating systems in several countries - and downloaded on a large scale – but apparently not used. In Germany, a country with very traditional consumers, certain m-payment apps have been downloaded more than 50,000 times (e.g. O2 Banking and Boon). Yet most German POS (point-of-sale) payments are carried out in cash (Koppe, 2015). This indicates that although consumers appear to be interested, and intend to use m-payment, they are for some reason avoiding this technology. In light of this, we believe that if a consumer shows the intention to use only the m-payment service, he/she will be more likely to use it if it includes an extra service.

A number of studies offer empirical evidence indicating a favorable intention of users towards mobile technology when they hold positive beliefs about it (Pham & Ho, 2015; Baptista & Oliveira, 2016). Beck and Ajzen (1991: 286) state that "... intentions are assumed to capture the motivational factors that influence a behavior..." and indicate the strength of the individual's will to behave, or how much effort he/she plans to exert, in order to carry out the behavior. Intention, used in studies based on the TAM, TRA and TPB, is defined as the likelihood that an individual will use a technology (Mohammadi, 2015).

Based on the preceding notions, this study assumes that intention to use (IU) and the interest of the individual in using 10 different additional mobile services are antecedents of behavioral intention (BI). This is defined as follows: an individual will

adopt an m-payment if the system offers additional services that generate value for the client beyond the simple monetary transaction.

7.2.4 The role of personal innovativeness

The concept of Personal Innovativeness in Information Technology (PIIT) is often used in the IS context to grasp the adoption of IT products and services. However, few studies have investigated the differences between individuals with different levels of PIIT in the adoption of m-payments and, even less, the adoption of m-payments when the offer includes additional mobile services.

PIIT can be defined as ‘‘... the willingness of an individual to try out any new information technology...’’ (Agarwal & Prasad, 1998), and is conceptualized as a personality trait which is not influenced by environmental or external variables. Prior conceptualizations of this construct (Rogers & Shoemaker, 1971; Rogers, 2003;) define it as the stage at which an individual adopts an innovation during its diffusion process. Thus, individuals are characterized as innovative if they are early to adopt an innovation (Agarwal & Prasad, 1998).

Previous research (Lu, Yao, & Yu, 2005; Yang, Lu, Gupta, Cao, & Zhang, 2012) has outlined the PIIT effect on intention to use a new technology and determined that individuals with higher PIIT levels develop more positive perceptions about innovation in terms of advantage, compatibility and ease of use (Lu *et al.,* 2005). Hence we believe that behavioral intention will vary according to how the different levels of personal innovativeness are influenced by integration of the offer of additional mobile services to m-payments.

7.3. Research Methods

7.3.1 Measurement model, materials and measuring instrument

The model proposed in this study is composed of twelve reflective constructs. Reflective indicators are used throughout information system literature in association with concepts such as intention to use and attitude toward use. Reflective constructs have led to the observation of measures that are affected by an underlying, latent, unobservable construct (MacCallum & Browne, 1993). “Changes in the underlying construct are hypothesized to cause changes in the indicators ...” (Jarvis, MacKenzie, & Podsakoff, 2003: 200), meaning that variations in the latent construct will cause all of its measures

to reflect this change (Pousttchi & Goeke, 2011). This implies that every indicator be described exactly the same as the other. It is most important that "... the researcher should decide in advance which are effect and which are cause-indicators ..." (Bollen, 1984: 383) to avoid bad construct validity (Jarvis *et al.*, 2003).

The current study therefore adopts a reflective model for three main reasons: (1) the constructs cause variance in their reflective indicators, (2) correlations among the indicators are higher than expected (the constructs of the interest in using additional m-payments services show values between 0.874 and 0.594; IU between 0.874 and 0.807; BIU between 0.777 and 0.731) and (3) each indicator is by design collinear with the other indicators. The constructs in the specific case of Additional Services are reflective because the indicators have the same or very similar content, as they evaluate two similar aspects of each of the 10 different types of additional m-payment services.

In this context, all indicators of each construct describe the same aspect of IU, BI and of interest to use of additional m-payments services. In other words, the construct bears an influence on the indicators.

The items included in the questionnaire (see Appendix A) allowed the participant to evaluate each of the 10 different additional mobile services and situations in which they could be combined with m-payment at the POS. These situations were presented to the participants by edited photos. The question and the answer options designed to determine the degree of interest in use of this service combined with m-payment were placed below the image. The degree of interest of these questions was measured with a five-point Likert-type scale with anchors ranging from "not interested" to "very interested" following the method applied by Durante and Woodham (2017). For each additional mobile service, the user was presented two similar situations to determine their interest in using each service with m-payment.

The participants were also informed that the situations and offers of additional mobile services were fictitious, designed only for the experiment as examples of future m- payment procedures.

The questionnaire also contained items to measure all the constructs of the model, as well as sample demographic questions (gender, age and education). Regarding the IU and BI constructs, the respondents expressed their agreement/disagreement with the statements by means of a five-point Likert-type scale with anchors ranging from "strongly disagree" to "strongly agree." All indicators are shown in Appendix A. The measurement validation and model testing are explained in the next section.

7.3.2 Data collection and sample characteristics

Based on the theory presented above, this research applied a standardized, self-administered, online questionnaire comprising 36 questions. Prior to use it was subject to several preliminary tests to ensure reliability. The questionnaire was available on the Internet from 1 November, 2013, to 14 January, 2014. To access the highest possible number of respondents, the survey was published in different Internet blogs, communities, news websites and press releases in Germany aimed at the defined target group.

The survey initially received 2,379 responses. After eliminating the invalid cases (missing data, inconsistent answers, duplicated mailing address, completion in less than the minimum 8 minutes), the final sample was reduced to 2,210. Of the 2,210, 47.3% were women and 52.7% men. The main age group comprised young people from 18 to 25 (82.9%). Regarding educational background, most possessed a high school diploma (69%) and 83.4% were less than 25.

7.4. Analysis and Results

7.4.1 Measurements and modeling testing

Descriptive statistics and Structural Equation Modeling (SEM) analyses were conducted with the SPSS Statistics 20 and the SPSS Amos 21 software packages.

The choice of an analysis based on covariance was deliberate for three main reasons: (1) the theoretical model is sufficiently backed by the theory (2) the consistency of the estimation of the parameters is great and (3) the attempt to estimate model only with reflective indicators (del Barrio García & Martínez, 2012)

Hence, this study carried out the following four-step approach to the data analysis: (1) a detailed assessment of the measurement model, (2) an estimation of the structural equation model to ensure that the conclusions gleaned from the structural relationships are drawn from a set of validated measurement instruments, (3) a discussion based on the results of the role of additional services on m-payment ~~s~~ adoption, and (4) an exploration of the differences between respondent groups based on the factor of the level of personal innovativeness.

7.4.2 Assessment of the measurement model

A Confirmatory Factor Analysis (CFA) based on SPSS AMOS 21.0 software was carried out to assess the measurement model and examine the relationships among the constructs within the proposed model (Arbuckle, 2012). As recommended by Hair, Anderson, Babin and Black (2010), the maximum-likelihood method was adopted to estimate the model's parameters where all analyses were conducted on variance–covariance matrices. This was followed by fit indices in order to assess the model goodness-of-fit.

Since the results of the skewness and kurtosis tests did not offer a normal distribution (multivariate kurtosis = 129,160; RC = 79,564), it was decided to estimate the model using the maximum likelihood method and bootstrapping technique for 1,000 consecutive steps or samples (del Barrio García & Martínez, 2012; Finney & DiStefano, 1996). In addition, this resampling technique reverted to the Bollen-Stine p-value correction method as well as the correction of the construct standard errors with a confidence level of 95%.

The X^2 of the measured model presented an expected level of significance (X^2 = 1377,069; D.F.= 233, p=0,000). The other indexes of goodness of fit were also significant: Goodness of Fit (GFI) = 0.952; the Adjusted Goodness of Fit Index (AGFI)= 0.928; the Comparative Fit Index (CFI) = 0.971; the Root Mean Square Residuals (RMSR)= 0.042; the Root Mean Square Error of Approximation (RMSEA)= 0.047, the Parsimonious Normed Fit Index (PNFI)= 0.966; and Normed Fit Index (NFI)= 0.692.

The next step, following the positive CFA results, was to assess the convergent and discriminant validity, in addition to determining the adequacy of reliability in order to evaluate the psychometric properties of the measurement model.

The Composite Reliability (CR) analysis showed that the variables presented values greater than those recommended (above 0.70) indicating a high degree of internal consistency and reliability, and that the multicollinearity does not suppose a problem (Hair, Anderson, Babin & Black, 2010). In the same way, the measurement model's convergent and discriminant validity was evaluated by the Average Variance Extracted (AVE) showing that the scales accord values greater than those recommended (above 0.50) suggesting adequate convergence (Hair *et al.*, 2010).

In addition, the adequacy of the sample was also examined by means of the Measure of Sampling Adequacy (MSA) of each item. Values were calculated for both the entire correlation matrix and for each individual variable determining the appropriateness

of applying factor analysis. The results revealed that constructs and variables have higher values than the value of 0.50 recommended by the literature (Hair *et al.*, 2010).

The combination of the evidence of reliability, convergent validity, and discriminant validity indicates that the reflective constructs were appropriate.

Multicollinearity was then assessed by the magnitude of the bivariate correlations between the exogenous variables. The results indicate values below the common cut-off point of 0.8 as recommended by Berry & Feldman (1985). In addition, the absence of multicollinearity, and its lack of effect on the analysis, were confirmed through the covariance between the exogenous variables which showed low values differing significantly from zero.

7.4.3 The structural model analysis and discussion

After validation of the scales, the estimation of the model was performed by the analysis of Structural Equation Modeling (SEM) through the Amos 21 software, as in the case of the CFAs for the validation of the scales.

The estimated structural model presented fairly acceptable Goodness of Fit Indicators (X^2 = 1382.681, DF = 238, p = 0.000; Goodness of Fit Index (GFI) = 0.952; Adjusted Goodness of Fit Index (AGFI) = 0.929; Root Mean Square Residuals (RMSR) = 0.042; Root Mean Square Error of Approximation (RMSEA) = 0.047; Parsimonious Normed Fit Index (PNFI) = 0.966; and Normed Fit Index (NFI) = 0.707) (Hair et al., 2010; del Barrio García & Martínez, 2012).

To understand the influence of mobile services in consumer adoption of m-payments, the proposed model was estimated and analyzed so as to ascertain the influence of each additional service on the intention to use and behavior intention to use m-payments. The SEM estimates results are listed in Table 12.

Table 19 - SEM Estimates

			Estimate	P	Result
CO	→	IU	0,212	***	Accepted
SL	→	IU	0,073	**	Accepted
PR	→	IU	-0,070	*	Accepted
EN	→	IU	-0,053	n.s.	Rejected
SM	→	IU	0,099	**	Accepted
PE	→	IU	0,105	**	Accepted
TI	→	IU	0,206	***	Accepted
LB	→	IU	-0,086	***	Accepted
RA	→	IU	0,036	n.s.	Rejected
LO	→	IU	0,126	***	Accepted
CO	→	BI	-0,039	n.s.	Rejected
SL	→	BI	-0,025	n.s.	Rejected
PR	→	BI	0,033	n.s.	Rejected
EN	→	BI	0,136	***	Accepted
SM	→	BI	-0,049	*	Accepted
PE	→	BI	0,051	n.s.	Rejected
TI	→	BI	0,083	***	Accepted
LB	→	BI	0,121	***	Accepted
RA	→	BI	-0,010	n.s.	Rejected
LO	→	BI	0,235	***	Accepted
IU	→	BI	0,251	***	Accepted

Note: *** p-value ≤0.001, **p-value ≤0.001, p-value ≤0.05

The findings therefore indicate that the interest in using **Couponing** in conjunction with mobile payment positively affects the intention to use (β = 0.212, $p \leq$ 0.001). However, although couponing has the most significant and strongest effect on the intention to use of all the services, it has no significant effect on Behavioral Intention (β = -0.039, p = 0.160). This can be explained by the fact that individuals are motivated to use m-payments for this type of service at a stage prior to behavior. **Couponing** then may be an incentive to encourage customers to consider this means of payment, although the offer of this service is not enough to induce the future user to assume an m-payment usage behavior.

The findings indicate that the interest in using **Shop Lists** service in conjunction with a m-payment tool, in turn, does directly affects the intention of use of m-payments (β = 0.073, p ≤ 0.05). Yet it does not directly affect the behavioral intention to use m-payment (β = -0.025, p = 0.345). This suggests that although it could be an interesting service at the moment the tool is adopted, but will not influence the behavior of m-payment use.

The findings indicate that the interest in using **Product Information** service with m-payment directly affects intention to use ($\beta = -0.070$, $p \leq 0.05$) as the findings point to a negative effect that, although minor, can be explained by the fact that users are not interested in this type of information at the moment of payment, but in the stages previous to the payment when they are considering which product to purchase. It is at this moment that the service is possibly considered an inadequate measure (Hsu, Chen, Kikuchi & Machida, 2017). Furthermore, the results of the study indicate that the interest in using the product information service does not directly affect behavioral intention of use ($\beta = 0.033$, $p = 0.149$).

The findings indicate that the interest in using **Entertainment** services with mobile payment does not affect the intention of use ($\beta = -0.053$, $p = 0.281$). On the other hand, it has been demonstrated that this service has a significant and positive effect on the behavioral intention of use of mobile payment services ($\beta = 0.136$, $p \leq 0.001$). This indicates that this type of service including recommendations and ringtone gifts has a great effect on conditioning use behavior, but does not serve as an incentive to generate intention of use.

The findings indicate that the interest in using **Social Media** services with m-payments effects both the intention to use ($\beta = 0.099$, $p \leq 0.01$) and the behavioral intention to use ($\beta = -0.049$, $p \leq 0.05$). While the effect on the intention to use is positive, it is negative on the behavioral intention to use. This can be explained by the desire of customers to obtain this type of information or service in a phase prior to use of the payment tool while the customers are still considering its use at the point of sale.

The findings indicate that the effect of the interest in using **Personalized Information** service with a mobile payment tool on the intention to use the mobile payment is significant and positive ($\beta = 0.105$, $p \leq 0.01$). However, the effect of the interest in using this additional service has not been significant in the behavioral intention to use m-payments ($\beta = 0.051$, $p = 0.135$) indicating that it can be a great predictor of IU, but not of BI.

The interest in using **Ticketing** services with m-payments is shown to affect both the intention to use ($\beta = 0.206$, $p \leq 0.001$) and the behavioral intention to use m-payments ($\beta = 0.083$, $p \leq 0.001$). The findings show that the greater the user's interest in this additional service, the greater both the intention to use the mobile payment service and the behavior use. These results confirm the findings of Rodrigues et al. (2014) that

integrating ticketing and discount coupons directly into the payment process is a factor that from the consumer point of view adds value to this type of payment.

The findings also reveal that the interest in using **LBS** service with the mobile payment has a significant effect on intention of use (β = -0.086, p ≤ 0.001) and on behavioral intention of use m-payments (β = 0.121, p ≤ 0.001). This indicates that the interest in this service has a positive effect on the behavioral intentions while the effect on the intention to use is negative. This can be explained by the fact that the commercial benefits of the LBS for the user are beneficial only by convenience when the customer already intends to use the payment method and only waits for an opportunity to use it. The LBS services could in fact assist in that behavioral decision, but could be a drawback if used to generate intention of use.

The findings indicate that the interest in using **Rating** services with the m-payment and its effect on the intention and behavior of mobile payment use are not statistically significant (β = 0.036, p = 0.084; β = -0.010, p = 0.516). First of all, the purposes of these ratings are to help consumers to identify trustworthy retailers and to aid retailers in building trust among consumers (Luo & Cook, 2008). However, the findings of the present research indicate that, a priori, this service is not relevant for the adoption of mobile payments by future users in this moment.

Finally, the interest in using **Loyalty Program** services in conjunction with m-payments has significant effects both on the intention to use (β = 0.126, p ≤ 0.001) and on the behavioral intention to use (β = 0.235, p ≤ 0.001). In addition, the findings reveal that the loyalty program service has a stronger effect on the behavioral intention than on all other studied services. This can be a great advantage especially when motivating the behavior of m-payment use, as this plays in favor of the use both in the intention to use as in the behavioral intention.

As in the case of previous studies (Di Pietro et al., 2015), we confirm that the intention to use positively affects the behavioral intention to use m-payments (β = 0.251, p ≤ 0.001) and is the strongest relationship of the model. This also indicates that the higher the intention to use an m-payment system, the higher the behavioral intention to use m-payments.

The results of present study indicate that the relationship between the interest in using additional services with m-payment plays an important role in the adoption of m-payments when the additional services offer benefits. That is, if customers are interested in additional services, they will surely be more motivated to use m-payments, especially

if they receive these services in exchange for use. In this case, the important point to highlight is that the services are decisive when it comes to persuading consumers toward m-payment use.

To further scrutinize this aspect, we focused on the estimates of the constructs of interest in using specific additional mobile services to the payment method and their respective significance. The services that showed positive and significant influences on consumer behavioral intention are as follows: Loyalty Programs (β=0.235; $p \leq 0.001$), Entertainment (β=0.136; $p \leq 0.001$), LBS (β=0.121; $p \leq 0.001$), and Ticketing (β=0.083; $p \leq 0.001$). The services with positive and significant influences on consumer intention, in turn, are the following: Couponing (β=0.0212; $p \leq 0.001$), Ticketing (β=0.206; $p \leq 0.001$), Loyalty Program (β=0.126; $p \leq 0.001$), Personalized Information (β=0.105; $p \leq 0.01$), Social Media (β=0.099; $p \leq 0.01$) and Shop List (β=0.073; $p \leq 0.05$).

On the other hand, the Rating service did not prove to be significant in any relationship allowing us to state that it should not be integrated, at least, into initial offers of m-payments systems.

In addition, although the most important relationships mentioned above are significant in the proposed model, care must be taken when offering them since additional services such as Entertainment and LBS demonstrated to have a positive effect on consumer behavioral intention, as well as present a slightly negative effect on the intention to use. Similarly, the offer of Social Media service has a positive effect on the intention to use but generates a slight negative effect on behavioral intention to use.

Based on these notions, our recommendation is to explore the benefits of future mobile services integration with caution and strategically, and offer services a priori with positive effects in both stages of the adoption process, as is the case of the services of Loyalty Program and Ticketing.

7.4.4 Multi-group analysis

One of the objectives of this work regarding consumer behavior between groups in a comparative context implies demonstrating that there are divergences or similarities between different groups. According to Baron and Kenny (1986, p. 1174), a moderating categorical variable ‘‘… affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable.’’

To contrast the main hypothesis of this research, the level of innovation was used as a categorical moderating variable to analyze the differences between groups. The respondents completed five questions related to personal innovativeness on a 5-point Likert scale. Item PIIT4 was removed from the analysis because in an individual CFA of the scale it was shown that this item carried a different factor from the other items.

We have, however, used the responses to the other four questions to classify them into two groups according to the median of each item (high [≥15] and low [≤14] level of personal innovativeness). The High Group (high level) consisted of 1018 individuals, while the Low Group (low level) comprised 1192.

Then a multigroup analysis was carried out to determine the significant differences between the two groups. To determine the existence of differences, we carried out the invariance test by means of a Chi-squared (χ^2) value comparison (and the degrees of freedom) for the overall model and the constrained model (Table 2).

Furthermore, after checking the existence of significant differences, and with the aim of testing the moderating effect of the proposed variable, we applied a test comparing the regression coefficients or weights between structural models considered in pairs, using a modified Student's t test for independent samples (Goodman & Blum, 1996; Lee, Lee, & Yoo, 2000). The results are listed in Table 13.

Table 20 - Invariance analysis and SEM estimates for multigroup analysis

Invariance analysis						
Overall model	χ^2	df	$\Delta\chi^2$	Δgl	*p*-Value	Invariant
Unconstrained	1342.935	400	120.486	29	0.000	No
Fully constrained	1463.421	429				

SEM estimates for multigroup analysis						
Moderating effect	Level of Personal Innovativeness					
Effect	High level	p-value	Low level	p-value	T test	Differences
IU → BI	0.64	0.000	0.308	0.000	-3.627*	Yes

Note: Significant at *0.001 level; the evaluation was performed using the procedure suggested by Chin (2000) to develop a multi-group analysis based on student's t-test.

The results of the tests indicate significant differences between the high and low level of personal innovativeness ($\Delta\chi2 = 120.486$; $\Delta gl= 29$; $p= 0.000$). This suggests that

the intention to use m-payments affects to a greater extent the behavioral intention to use m-payments of individuals with a lower (βLow=0.308; p ≤0.001), as opposed to a higher (βHigh=0.164; p ≤0.001), level of personal innovativeness.

In addition, these differences can also occur because individuals with a low level of innovation need more incentives to adopt new technologies than those with higher levels. Thus the intention of individuals with a low level of innovation is raised to a more important level in the decision to use an m-payment tool. So, if individuals with a lower level of innovation already possess an intention to use m-payment, then they will be positively interested in adopting m-payments if they perceive benefits.

On the other hand, the relationships between the interest to use the 10 additional services and IU/BIU do not present significant differences between the groups.

In this way, the relations between the interest in using certain services and the intention to use have the same significances for both groups indicating that the interest in using some additional m-payment services has a positive effect on the behavioral intention to use m-payments and not on others.

The interest in using a new technology is an indicator of the attitude toward that technology (Davis, 1989). Along that line, the approach of Ajzen and Fishbein (1980) substantiates that a positive user attitude toward a technology, referring in this case to m-payment, improves future intentions/behavioral intentions of use.

The experiment developed by Rodrigues *et al*. (2014) reveals that although integration of m-payment in combination with additional mobile services is highly valued by most users, it also involves complexity in procedures and cognitive overload at the time of payment.

Therefore, it is clear that users are not interested in the offer of a number of additional mobile services for payments except those that best fit their lifestyle and their way of purchasing products and services. The convenience of having the wallet and integrated discounts in an m-payment can be a very attractive solution, as long as the payment process does not become too complicated.

7.5. Conclusions

7.5.1 Summary and further research/ Theoretical Implications

While numerous studies analyze the acceptance of new technologies, this study aspires to be a valuable source of empirical and conceptual research on the subject of the

offer of additional services to m-payment systems. This research is novel from a trial perspective.

First, it provides a new model analyzing 10 different mobile services that can be integrated into m-payment as an incentive to motivate its adoption. Secondly, this study provides a comparative analysis of two groups with different levels of personal innovativeness and how this factor can affect the behavioral intention of use of m-payments. Finally, this research was carried out in Germany where m-payment shows an incipient level of penetration so the results have practical applications.

The main objective of this work is to study how additional mobile services can increase adoption of m-payments and the role of personal innovativeness in adopting m-payment in the framework other mobile services. As recommended by Dahlberg, Guo, and Ondrus (2015) and Kim, Mirusmonov and Lee (2010), this study seeks to offer new perspectives on m-payment systems, a relatively new field.

In terms of theoretical construction, this study strives to attain its objective by proposing a model that explains the behavioral intention of use of m-payments conditioned by its antecedents, i.e. the intention of use of m-payment and the interest in using additional m-payment services.

The findings indicate that IU is a strong predictor of BI. Hence the greater the intention to use the m-payment system, the more likely an individual will be interested in using a new mobile payment if additional mobile services are offered.

According to Schierz, Schilke and Wirtz (2010), one of the main reasons for the slow diffusion of mobile applications in general, and m-payment in particular, could be the failure in communicating its clear benefit to potential users. Our model reflects a clear desire among customers in use additional services with m-payment and that the use of m-payments can be increased by offering additional mobile services. These services can also be understood as consumer benefits, in this sense consistent with previous studies claiming that benefits affect the intention of use (Arts, Frambach, & Bijmolt, 2011).

In addition, convenience and savings are the primary motivations for using a mobile phone for shopping (Shankar, Kleijnen, Ramanathan, Rizley, Holland & Morrissey, 2016), and m-payments allow eliminating the need of cash (Pham & Ho, 2015), offer convenience and speed (Teo, Tan, Ooi, Hew, & Yew, 2015), and, if integrated with additional mobile services, offer the customer the possibility of saving on purchases and allow the retailer to develop a more personal relationship with the client.

This study has specifically brought to light that the interest in using additional services is a great antecedent of behavior and that it plays an important role in the intention to use and, consequently, in the adoption of this type of payment system. A conclusion is that adoption of m-payments is facilitated, hence faster, if m-payments are accompanied by additional payment services such as Loyalty Program and Ticketing.

The present study also analyzes the differences between two different levels of personal innovativeness. The results have shown that there are significant differences between groups and how the level of personal innovativeness affects the BI. For users with a high level, the effect of intention is less in the BI than for the users with low levels.

The results of the multigroup analysis indicate that individuals with lower PIIT levels are more likely to use m-payments when an additional service is included. This is confirmed by the explained variance of the model that is lower for individuals with the lowest level (R2 = 0.369) than for those with the highest level (R2= 0.541). According to Rogers (2003) individuals that are more open to use new technologies usually fall into a higher socioeconomic status and possess other characteristics that set them off from other types of adopters. Hence it is our belief that individuals with a higher level of personal innovativeness are more motivated to use m-payment due to other factors such as the system's characteristics and usability than by additional mobile services.

The explanation for these findings may reside in the propensity of early adopters to take risks. Personal innovativeness reflects the willingness of an individual to test new information technology, and individuals with a high level of personal innovativeness are likely to be impulsive by nature and may not think through the reasons and implications for their actions (Agarwal, Ahuja, Carter, & Gans, 1998). Thus, in the field of IT, individuals with a high level of personal innovativeness are more open to testing technology because of their curiosity and willingness to take risks, and do not necessarily base their decision on concrete advantages. On the other hand, individuals with low levels of personal innovativeness carefully consider the reasons and consequences of adopting the technology, thus forming concrete beliefs regarding the benefits of use of a particular technology.

7.5.2 Managerial implications

One of the objectives of this study is to generate information relevant to companies and others organizations interested in disseminating m-payment technology.

According to the diffusion theory, users are only willing to accept innovations if they provide a unique advantage superior to existing solutions (Rogers, 2003). Following this notion, we advance the following recommendations.

Firstly, we encourage players in the m-payment ecosystem to continue searching for ways to develop value for consumers through m-payment systems as opposed to traditional media. The major advantages of m-payment versus traditional methods are convenience and speed (Teo *et al.*, 2015). Adding the offer of other mobile services to m-payment systems can boost benefits for both consumers and other participants. Secondly, the results of this study encourage those interested in disseminating m-payment systems to integrate additional services that offer added value. In this study, Loyalty Program and Mobile Ticketing services, in particular, receive the most attention from consumers because they are significant in both the intention to use as in the behavioral intention to use m-payments. The idea of being rewarded for loyalty, where bonus points can be accumulated and automatically redeemed in the payment procedure, is a very attractive service according to the interviewees. In addition, the idea of receiving a public transport ticket or parking payment after making a payment with the mobile phone, is also widely valued.

Thirdly, the findings of this paper serve as a reminder that consumers have different points of view regarding the value of additional m-payment services. The findings reveal that individuals with a high PIIT level are less attracted to mobile services than those with a low level. So, if individuals with a lower level of innovation already possess an intention to use m-payment, then they will be more positively interested in adopting m-payments if certain benefits are offered.

The findings also bring to light a controversy: individuals with a low level of innovation, with a lower capacity of handling complex systems, show more interest in m-payment services. Following the results of the study by Rodrigues *et al.* (2014), we recommend that m-payment system developers seek to put in balance the number of integrated services, and that if they decide to include several tasks when making the payment, they not neglect maintaining speed and simplicity for a greater and faster user adaptability.

Although there is a wide range of technological possibilities in the development of m-payments, it is essential to manage customer expectations. The consciousness of first impressions should strongly focus on quickly developing a sense of confidence,

familiarity, and added value with technology for sustained use and later exploration of the more advanced features (Rodrigues *et al.*, 2014).

The results of this study also suggest that m-payments may need to be explored from a new perspective, focusing not only on the provision of a new payment method, but seeking to offer an integration platform for mobile services - especially mobile marketing with m-payments - to develop new revenue streams for payment service providers through data-driven marketing while generating value for the customer.

Highlighting the benefits of additional m-payment services for both businesses and consumers is also of paramount importance in the dissemination of m-payments. Among its benefits is ecological correctness as it avoids the use of paper/plastic on the part of business and prevents the loss, among others, of purchase receipts, coupons, ticketing, loyalty cards for consumers. In addition, it enables businesses to gather customer purchasing information and exploit it to design better strategic decisions. The consumer, in turn, will benefit from an offer of services best suited to his/her needs.

7.5.3 Limitations and future research

Besides its general contribution to the dynamic of the acceptance of m-payment systems, this paper's findings pave the way for new lines of research. Yet, in spite of following a strict and exhaustive method, this study has a series of limitations. Firstly, it focuses on the acceptance of m-payment services in general. We deliberately did not opt to explore or classify specific m-payment solutions. Therefore, future research could build on the structural model presented in this paper in a modified or extended version and/or enlarged to adapt to specific payment solutions. Secondly, this study is restricted to Germany. It would be of interest to survey these questions in other countries. This would allow an overall testing of the generalizations gleaned in this work and/or shed light on the major cultural differences that can play a role in the m-payment adoption process. And finally, the questionnaire included photographs representing different situations of the offer of additional m-payment services use to enquire among future users as to their interest in adopting each of the 10 mobile services. We suggest that future research resort to more lifelike tools (such as a video simulating real use) allowing the user to evaluate more concretely his/her interest in mobile services.

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Appendix

Appendix A - Questionnaire items		
Intention to use	IU1	I am generally willing to use my cellphone for payment.
	IU2	If I get the chance to pay with my cellphone, I will use it.
	IU3	If a retailer gives me the option to use an m-payment procedure, I intend to do so.
Behavioral Intention		I will use my mobile device for payment, if…
	BI1	…I receive offers of supplements.
	BI2	…I am offered added values
	BI3	…a retailer offers this type of procedure with supplemental services.
Interest in using additional services		
Couponing	CO1	How interested are you in using this mobile service procedure? (Discount voucher*)
	CO2	How interested are you in using this mobile service procedure? (Extra product voucher*)
Shopping List	SL1	How interested are you in using this mobile service procedure? (Supermarket shopping list*)
	SL2	How interested are you in using this mobile service procedure? (Christmas wish list*)
Product Information	PR1	How interested are you in using this mobile service procedure? (Shampoo product information*)
	PR2	How interested are you in using this mobile service procedure? (Product information to help setting up the newly purchased product*)
Entertainment	EN1	How interested are you in using this mobile service procedure? (Find other accessories for the purchased product*)
	EN2	How interested are you in using this mobile service procedure? (Pick 1 of 20 ringtones or 1of 20 collector cards*)
Social Media	SM1	How interested are you in using this mobile service procedure? (Share your purchase with your friends in social media*)
	SM2	How interested are you in using this mobile service procedure? (Share your location with your friends through social media*)
Personalized Information	PE1	How interested are you in using this mobile service procedure? (Find something to match with your new product*)
	PE2	How interested are you in using this mobile service procedure? (Recommend products related to the purchased product*)
Ticketing	TI1	How interested are you in using this mobile service procedure? (Gift of a parking ticket for a purchase*)
	TI2	How interested are you in using this mobile service procedure? (Gift of a subway ticket for purchase*)
Location-Based Systems	LB1	How interested are you in using this mobile service procedure? (Receive a gift if you purchase something in a particular nearby store*)
	LB2	How interested are you in using this mobile service procedure? (Notice of promotion in a store and how to get there *)
Ratings	RA1	How interested are you in using this mobile service procedure? (Evaluate a product you just acquired *)
	RA2	How interested are you in using this mobile service procedure? (Evaluate the purchasing experience *)
Loyalty Programs	LO1	How interested are you in using this mobile service procedure? (Program of accumulation of points to redeem them for discounts on future mobile purchases*)

	LO2	How interested are you in using this mobile service procedure? (Program of accumulation of points to later redeem them for products of the store *)
Moderator		
PIIT	PIIT1	When I hear about new mobile technology, I actively look for ways to use it.
	PIIT2	I think it is very interesting to try out new technologies.
	PIIT3	Generally speaking, I like to use new technologies.
	PIIT4	I cannot live without my mobile device.
	PIIT5	I absolutely want to use the m-payment methods, but there is still no feasible and elaborate procedure on the market.

Note: *These situations were presented to the participants by edited photos; all indicators are measured with a five-point Likert scale.

CAPÍTULO 8

CONCLUSIONES

En páginas anteriores se han presentado cuatro trabajos empíricos relacionados con la intención de los consumidores hacia el uso de los pagos móviles. En este capítulo se presentan de forma global y unificada las principales conclusiones obtenidas, así como las principales contribuciones académicas generadas. Además, se exponen las implicaciones más importantes para la industria, de cara al desarrollo y adopción de los pagos móviles. Finalmente, se indican algunas limitaciones de los estudios realizados, así como posibles líneas para futuras investigaciones en el ámbito de los pagos móviles.

8.1 Conclusiones principales

Pese a que los primeros intentos para implantar servicios de pago móvil viables entre consumidores y empresas (B2C) comenzaron hace más de una década, ninguna solución de pago de las que se han desarrollado hasta la fecha ha sido particularmente exitosa (Pousttchi, Schiessler, & Dietmar, 2009). No obstante, en los últimos dos años se han realizado importantes avances de manera que hoy en día contamos con un mercado más receptivo y, por tanto, el potencial para alcanzar un uso generalizado de este tipo de herramientas de pago es ahora mayor que en el pasado. De esta manera muchos mercados ya cuentan con regulaciones específicas para este tipo de servicio, grandes bancos y empresas de tecnologías han presentado sus soluciones de pago móvil, y el uso de tecnologías como NFC y códigos QR ya son más comúnmente utilizadas por empresas y por segmentos específicos de consumidores.

Sin embargo, quizás el gran desafío para la definitiva generalización de los pagos móviles es su adopción masiva por parte de los consumidores. Esta tesis doctoral se ha focalizado expresamente en proporcionar claves sobre los determinantes que pueden acelerar ese proceso de adopción analizando diferentes aspectos de los pagos móviles desde el punto de vista del consumidor, con el objetivo de contribuir a reforzar la base de conocimiento para el desarrollo de investigaciones futuras, como para ofrecer información significativa para empresas y desarrolladores de sistemas de pagos móviles B2C.

Cada uno de los cuatro estudios empíricos presentados en los capítulos anteriores son complementarios entre sí, y han generado cuatro modelos relación con la adopción de pagos móviles (M1, M2, M3 y M4, respectivamente), incluyendo factores diversos y ofreciendo una serie de conclusiones relacionadas con la actitud de los consumidores hacia este tipo de herramientas. En la Tabla 8 y 9 se ofrece un resumen de dichos trabajos, sus objetivos y principales hallazgos.

Tabla 8 - Resumen de los cuatro estudios presentados

ESTUDIO 1	Objetivo	Principales hallazgos
User Behaviour in QR Mobile Payment System: The QR Payment Acceptance Model (QRPAM)	Analizar la aceptación de un nuevo sistema de pago móvil por medio de códigos QR, por los usuarios de teléfonos móviles y determinar los factores en su uso.	Las variables directamente más influyentes en la intención de uso en orden de importancia: ATT, PIIT y SN. La variable directamente no significativas en la intención de uso: IM.
		La variable directamente más influyente en la actitud hacia el uso: PU Las variables directamente no significativas en la actitud hacia el uso: IM, PS, PC, PEOU, SN.
		La relación entre PEOU y PU se ha demostrado como la 3ª más fuerte del modelo propuesto.
ESTUDIO 2		
Intention to Use New Mobile Payment Systems: A Comparative Analysis of SMS and NFC Payments	Analizar la aceptación por parte de los consumidores de los sistemas de pago móvil NFC y SMS desde el punto de vista del modelo conductual y determinar sus factores constitutivos.	En cuanto a la adopción del sistema de pago móvil por SMS, las variables más influentes en la intención de uso son en orden de importancia: ATT, PU, SN y PS.
		En cuanto a la adopción del sistema de pago móvil por NFC, las variables más influyentes en la intención de uso son en orden de importancia: ATT, SN, PU, PS.
		Las diferencias detectadas entre los sistemas de pago móviles por SMS y NFC refuerzan la idea de que el comportamiento del consumidor diferirá dependiendo del tipo de sistema de pago móvil, según se aprecia a través de la diferencia de intensidad de los diferentes constructos.
		Este estudio ha encontrado diferencias significativas entre tipos de pagos en los niveles entre SN y IU, PU y ATT, PEOU y PU, y finalmente, PEOU y ATT.
		Todas las relaciones citadas anteriormente son más fuertes para los pagos por NFC, con excepción de la relación PEOU y ATT, que ha sido no significativa para la adopción del pago por NFC y bastante significativa para el pago por SMS.
ESTUDIO 3		
Acceptance of NFC Technology for Mobile Payments: A Brazilian Perspective	Analizar la aceptación por parte de los consumidores del sistema de pago móvil NFC en Brasil, a partir de un modelo conductual que incluye determinantes para la aceptación de tecnología cuyo	Las variables directamente más influyentes en la intención de uso en orden de importancia: ATT, PIIT, SN y PS. La variable directamente no significativa en la intención de uso: IM.
		Las variables directamente más influyentes en la actitud hacia el uso en orden de importancia: PC y PU Las variables directamente no significativas en la actitud hacia el uso: IM y PEOU.

	principal factor de aceptación es la intención de uso.	La relación entre PIIT y PEOU, y SN y PEOU, se han demostrado como la 4ª y 5ª relación más fuerte del modelo propuesto.
ESTUDIO 4		
Exploring the Effects of Mobile Services on m-Payments adoption	Estudiar cómo los servicios móviles adicionales pueden aumentar la adopción de los pagos móviles y cuál es el papel de la innovación personal en la adopción del pago móvil en este contexto.	Poder predictivo de la intención de uso del pago móvil estudiado: 28% y en la intención de comportamiento de uso: 53.5%
		Las variables directamente más influyentes en la intención de uso en orden de importancia: El interés en usar cupones de descuento, tickets, programas de fidelización, información personalizada, redes sociales y lista de compras. Las variables directamente no significativas en la intención de uso: Interés en usar servicios de entretenimiento y de rating.
		Las variables directamente más influyentes en la intención de comportamiento de uso en orden de importancia: IU, el interés en usar programas de fidelización, entretenimiento, LBS (servicios basados en la localización) y ticketing. Las variables directamente no significativas en la intención de comportamiento de uso: el interés en usar cupones, lista de compras, informaciones sobre productos, informaciones personalizadas y rating.
		Análisis multi-grupo con los diferentes niveles de PIIT, se encontró que hay diferencias en la relación IU →BI, donde la intención tiene un efecto más fuerte en la intención de comportamiento de uso en las personas con un nivel más bajo de innovación personal que en personas con un nivel más alto.
		Las personas con menor nivel de innovación están más motivadas a usar el pago móvil si se les ofrece algún tipo de servicio móvil adicional al pago, mientras que las personas con un alto nivel de innovación, no tienen su comportamiento muy afectado por este tipo de beneficio, posiblemente están más motivadas por otros aspectos del pago móvil, como por ejemplo las características técnicas del sistema de pago, como la usabilidad y la adaptabilidad.

IU: intención de uso de los pagos móviles; ATT: Actitud hacia el uso del pago móvil; PU: Utilidad percibida; PEOU: Facilidad de uso percibida; SN: Normas subjetivas; PIIT: Innovación personal en Tecnologías de la Información; IM: Movilidad individual; PC: Compatibilidad percibida; PS: Seguridad percibida; BI: intención comportamental.

Tabla 9 - Resumen comparativo de las relaciones incluidas en los trabajos incluidos

Relaciones			M1	$M2_{SMS}$	$M2_{NFC}$	M3
Poder predictivo de la intención de uso del pago móvil estudiado			64%	56%	65%	71%
ATT	→	IU	0.971***	0.273***	0.375***	0.751***
SN	→	IU	0.247*	0.119**	0.353***	0.160***
PIIT	→	IU	0.244*	-	-	0.482***
IM	→	IU	n.s.	-	-	n.s.
PC	→	ATT	n.s.	-	-	0.188***
PS	→	ATT	n.s.	-	-	-
PEOU	→	ATT	n.s.	0.213***	n.s.	n.s.
IM	→	ATT	n.s.	-	-	n.s.
PU	→	ATT	0.692***	0.475***	0.955***	0.638***
SN	→	ATT	n.s.	-	-	-
PC	→	PU	0.349***	-	-	0.302***
PEOU	→	PU	0.471***	0.272***	0.500***	0.267***
PIIT	→	PU	n.s.	-	-	n.s.
IM	→	PU	n.s.	-	-	0.188***
PIIT	→	PEOU	0.235***	-	-	0.393***
PU	→	IU	-	0.162**	0.336***	-
PS	→	IU	-	0.065**	0.078**	0.092**
SN	→	PEOU	-	0.336***	0.407***	0.326***
SN	→	PU	-	0.474***	0.390***	n.s.
PS	→	PU	-	-	-	n.s.

Nota: (1) El M4 no ha sido incluido en esta tabla por no poseer ninguna relación semejante a las presentadas en los demás modelos. Conclusiones de este estudio se exponen en las próximas páginas. (2) *** p-valor ≤ 0.001; ** p-valor ≤0.05; * p-valor ≤0.10. (3) – la relación no fue incluida.

Los trabajos presentados son innovadores, al ser los primeros en: [1] analizar empíricamente los determinantes de la aceptación por el consumidor de los pagos QR sin utilizar únicamente la TAM como bases teórica (M1, M2 y M3), [2] realizar un análisis empírico comparativo de la aceptación por parte del consumidor de los pagos por SMS y NFC (M2), [3] en estudiar la adopción de los pagos móviles con NFC con una muestra brasileña (M3) y [4] en explorar la integración de servicios móviles de marketing como motivador del uso del pago móvil y cuál es el papel de la innovación personal en la adopción del pago móvil en este contexto (M4).

Los cuatro modelos propuestos en esta tesis doctoral han mostrado un gran **poder predictivo** de la intención de uso. El modelo para el sistema de pago QR (M1) explica un 64%, el modelo para los sistemas de pago por SMS y NFC ($M2_{sms/nfc}$) unos 56% y 65% respectivamente, y el modelo únicamente para el sistema de pago por NFC (M3) un 71%.

Dichos valores son superiores a los mostrados por otros modelos similares de aceptación de la tecnología (Lu, Yao, & Ye, 2005; Lu, Yang, Chau, & Cao, 2011; Yang, Lu, Gupta, Caso, & Zhang, 2012). Por último, el modelo M4 ha presentado un poder predictivo bastante satisfactorio, un 53.5% de la intención de comportamiento de uso.

En todos los modelos en que la actitud hacia el uso (ATT) del pago móvil fue incluida (M1, $M2_{sms/nfc}$ y M3) esta ha sido la variable directa más influyente en la intención de uso, siendo esencial para el aumento de la intención y el uso posterior del sistema de pago móvil propuesto (β=0.917, $p \leq 0.001$; β_{sms}= 0.273, $p \leq 0.001$; β_{nfc}= 0.375, $p \leq 0.001$; β = 0.751; $p \leq 0.001$). El poder de la actitud es notorio, probablemente porque los usuarios frente a las nuevas tecnologías suelen mostrar curiosidad y están predispuestos a su aceptación.

Las **normas subjetivas** (NS) como un elemento social que puede reforzar de manera directa la intención de usar una herramienta de pago móvil a través de códigos QR, NFC o SMS, resultó ser decisivo para su futura adopción en todas las investigaciones en las que fue considerada en esa tesis doctoral (M1: β=0.247, $p \leq 0.001$; $M2_{sms/nfc}$: β_{sms}= 0.119, $p \leq 0.01$; β_{nfc}= 0.353, $p \leq 0.001$; M3: β= 0.160; $p \leq 0.01$). Además, las normas subjetivas también presentaron un importante papel en la percepción de utilidad ($M2_{sms/nfc}$: β_{sms}= 0.474, $p \leq 0.001$; β_{nfc}= 0.390, $p \leq 0.001$) y de la facilidad de uso ($M2_{sms/nfc}$: β_{sms}= 0.336, $p \leq 0.001$; β_{nfc}= 0.407, $p \leq 0.001$ y M3: β=0.326, $p \leq 0.01$). Eso se debe a la alta interconexión actual entre individuos a causa del rápido y creciente desarrollo de las tecnologías de comunicación móvil, así como del uso generalizado de las redes sociales virtuales. Esto implica que los usuarios tienen en cuenta las opiniones de otros que son importantes para ellos.

La **utilidad percibida** (PU) ha representado un importante efecto en la actitud hacia el uso del pago móvil en todos los modelos en los que fue considerada en este trabajo (M1, $M2_{sms/nfc}$ y M3). La utilidad percibida ha afectado positivamente y en gran medida a la actitud hacia el uso de la herramienta de pago, siendo el efecto más fuerte en el $M2_{sms/nfc}$ y el segundo efecto más fuerte en el M1 y M3. A partir de estos resultados, se considera conveniente que la percepción de utilidad sea incluida en los estudios relacionados a la adopción de los sistemas de pago móvil. Además, para los pagos móviles por NFC y códigos QR, la combinación de la Innovación Personal y Utilidad Percibida por el futuro usuario se ha demostrado una combinación ganadora para esa adopción, tanto en Brasil como en España en ese momento de introducción del sistema.

La **seguridad percibida** (SP) ha tenido un papel diferenciado en los tres estudios en los que fue incluida (M1, $M2_{sms/nfc}$ y M3). No obstante, el efecto sobre la actitud hacia el uso no fue significativa (M1), mientras que en el $M2_{sms/nfc}$ y M3, la percepción de seguridad ha demostrado tener un efecto significativo en la intención de uso (β_{sms}= 0.065, p ≤0.01; β_{nfc}= 0.078, p ≤0.01; β= 0.092; p ≤0.05). Aunque se haya presentado una baja influencia directa de esta variable en la intención de uso parece importante incluir esta variable en estudios sobre adopción de los pagos móviles, debido a que los consumidores que muestren mayor nivel de seguridad percibida serán más propensos a aceptar nuevos sistemas de pago móvil.

La **innovación persona**l (PIIT) también demostró ser relevante para el uso futuro de los pagos móviles en los estudios en que fue incluida (M1 y M3). Ha mostrado una relación significativa con la intención de uso y con la percepción de facilidad de uso en ambos estudios, e indica que los usuarios con mayor nivel de innovación personal tendrán más probabilidades de aceptar los pagos móviles por códigos QR y NFC. Dicha variable ha tenido una importancia aún mayor en la intención de uso del pago NFC en los futuros usuarios de Brasil. Estos resultados reafirman la Teoría de la Difusión de Rogers (2003) que establece que, en el proceso de adopción de una nueva tecnología, normalmente los primeros en adoptarla son personas más abiertas a las nuevas tecnologías y más acostumbradas al cambio tecnológico y, consecuentemente, estas personas sirven como referencia a su entorno social, dando continuidad al proceso de adopción. Además, la **innovación personal** también ha demostrado ser importante como variable moderadora, para analizar diferencias en el comportamiento, ya que en el M4 la comparación entre grupos de individuos con niveles diferentes de innovación muestra la existencia de intereses distintos que afectan la intención de comportamiento (BI) de uso de pagos móviles al integrarlo con servicios adicionales.

La **compatibilidad percibida** (PC) fue incluida en dos de los modelos tratados en la tesis doctoral (M1 y M3) y también se ha demostrado significativa, en especial en la relación con la utilidad percibida (M1: β= 0.349; p ≤0.001; M3: β= 0.302; p ≤0.01). En el caso de la relación con la actitud hacia el uso por su parte, se ha demostrado significativa solo en el caso del sistema NFC (β= 0.188; p ≤0.01), pero no en el pago con código QR (β= 0.040; p =0.453). Estos hallazgos demuestran que cuando el sistema es compatible con el estilo de vida de los futuros usuarios y sus maneras de realizar compras de productos y servicios, la percepción de utilidad del sistema será incrementada, lo que apunta a la mayor facilidad

de la adopción del pago móvil con NFC.

La principal relación significativa de la **facilidad de uso percibida** (PEOU) fue hacia la utilidad percibida, en concordancia con los hallazgos de Davis (1989). Por su parte, en dos de los modelos en que fue incluida, su relación con la actitud hacia el uso de la herramienta se ha mostrado como no significativa (M1: β= -0.022; p = 0.735; M2: β_{nfc}= -0.078, p = 0.088; M3: β= 0.073; p = 0.141), siendo significativa sólo su relación con la actitud hacia el uso del pago por SMS (β_{sms}= 0.213, p $\leq$0.001). Estos resultados indican que, aunque la facilidad de uso percibida no tiene influencia directa en la actitud hacia el uso de la herramienta de pago con NFC y QR, sí que desempeña un importante papel en la percepción de utilidad de todos los sistemas de pago aquí estudiados.

La variable **movilidad individual** (IM) ha sido incluida en dos de los estudios incluidos en este trabajo (M1 y M3). De las tres relaciones planteadas en ambos modelos (con la intención de uso, actitud hacia el uso y utilidad percibida), únicamente una de ellas fue significativa: la relación con la utilidad percibida de los pagos con NFC en Brasil (M3: β= 0.188, p $\leq$0.001). Estos hallazgos son probablemente resultado del alto grado de movilidad de las poblaciones muestreadas, bastante homogéneas en cuanto al uso del móvil y otras tecnologías relativamente novedosas. De esta forma, es posible que esta variable, en tanto que común para toda la población, deje de tener importancia en la predicción del comportamiento

Las variables que medían el **interés en utilizar los servicios adicionales** al pago móvil (cupones, lista de compras, información sobre productos, entretenimiento, redes sociales, informaciones personalizadas, tickets, LBS, escalas de valoración, programas de fidelidad) han demostrado ser un buen antecedente del comportamiento y que este desempeña un importante papel en la intención de uso y consecuentemente, en la adopción de este medio de pago (M4). En particular se observó que, si los pagos móviles son integrados con programas de fidelización y ticketing, la adopción del pago móvil podría ser más rápida. Sin embargo, la integración de servicios de valoraciones de productos no refuerza la intención de uso de pagos móviles.

8.2 Implicaciones para la gestión

En un área como la comercialización y fomento de los pagos móviles, donde el avance de las tecnologías y de los servicios es muy acelerado, es importante adoptar

múltiples perspectivas con el objeto de conseguir una adopción masiva de su uso. Así que la perspectiva del consumidor y como éste percibe las herramientas de pago móvil es crucial.

Los estudios aquí presentados se han centrado en la aceptación del consumidor final de los sistemas de pagos propuestos, y proporcionan un conjunto de recomendaciones e implicaciones relevantes para las empresas interesadas en fomentar el uso de los pagos móviles, concretamente las soluciones de pagos que procesen la operación financiera por medio de SMS, NFC o Códigos QR.

Por su parte, el último estudio expuesto, no se remitió a una solución específica de pago móvil, ya que su objetivo principal fue explorar el papel de los servicios adicionales en la adopción de los pagos móviles, y como los diferentes niveles de PIIT impactan en la adopción de estos sistemas. En base a los resultados obtenidos nos permitimos hacer las siguientes recomendaciones:

(1) Los jugadores en el ecosistema de pagos móviles deben continuar buscando formas de desarrollar valor para los consumidores a través de los sistemas de pago en lugar de los medios tradicionales. En este sentido la adición de otros servicios móviles a los sistemas de pago móvil puede aumentar los beneficios percibidos por los consumidores y por los minoristas, ya que genera una gran oportunidad de intensificar la relación B2C.

(2) Algunos servicios móviles, como los programas de fidelización y regalo de tickets, reciben mayor atención por parte de los consumidores. De esta forma la idea de ser recompensado por realizar el pago con el móvil parece ser la mejor manera de incentivar a los futuros usuarios ampliamente valorada por los mismos.

(3) Los consumidores tienen diferentes puntos de vista sobre el valor de los servicios de m-pago adicionales. Los individuos con un bajo nivel de PIIT se ven más atraídos por el reclamo de la integración de servicios móviles que los que tienen un nivel más alto.

(4) Aunque este estudio ha demostrado que los individuos con un bajo nivel de innovación muestran mayor interés en los servicios de m-pago, hay que recordar que son menos capaces de manejar sistemas complejos (Rodrigues, José, Coelho, Melro, Ferreira, Monteiro, & Ribeiro, 2014). De este modo, recomendamos que los desarrolladores de sistemas de pagos móviles busquen equilibrar el número de servicios integrados y que, si deciden incluir varias

tareas al realizar el pago, no olviden mantener la velocidad y simplicidad de los procesos.

En relación con los estudios M1, M2 y M3, y utilizando una perspectiva conjunta de los resultados encontrados, tres variables se han mostrado como especialmente significativas: la **actitud hacia el uso**, las **normas subjetivas** y la **utilidad percibida**. De esta forma las implicaciones expuestas a continuación pueden ser consideradas por todos los interesados en desarrollar y fomentar el uso de herramientas de pago móvil usando SMS, NFC y códigos QR:

(1) La clave para la adopción de un medio de pago tan innovador como los pagos móviles reside en un cambio de mentalidad y de actitud, y más específicamente un cambio del uso de la tarjeta de crédito y del dinero en efectivo a los pagos usando los teléfonos móviles como herramienta. No obstante, es importante tener en cuenta que los pagos móviles requieren una compleja red de relaciones entre un gran número de actores, especialmente para ofrecer servicios financieros a una parte menos favorecida de la población, además de requerir una fuerte regulación gubernamental y de ámbito global (Diniz, De Albuquerque & Cernev, 2011).

(2) A la luz de los resultados aquí encontrados, las empresas deben enfocar en acciones que mejoren las **actitudes del usuario** hacia el uso de esta tecnología (proporcionando información sobre los beneficios del mismo mediante publicidad, promociones, etc.) para aumentar la disposición a utilizar esta tecnología. Estas actividades promoverán actitudes positivas hacia los sistemas de pago y una transmisión exitosa de su utilidad para mejorar el uso previsto.

(3) La **influencia del entorno socia**l en las decisiones de consumo es universal y común a todas las culturas y países, y quizás sea amplificada por el gran uso de redes sociales virtuales y de la búsqueda constante del consumidor de informaciones y recomendaciones antes de adquirir un producto o servicio. De hecho, muchas empresas con el fin de asegurar una posición ventajosa y explotar futuras sinergias ya utilizan las redes sociales. En el caso de los pagos móviles estudiados, las normas subjetivas también han demostrado un importante papel en la adopción de los mismos. Por lo tanto, creemos que es vital que las empresas interesadas en fomentar el uso de los pagos móviles

influyan en el entorno social y tecnológico actual del consumidor, principalmente a través de los medios sociales virtuales (Liébana-Cabanillas, 2012). Las empresas también deben controlar el entorno social en el comportamiento de compra de los usuarios, a través de una actividad promocional apropiada y que promueva todos los beneficios del pago móvil en las redes sociales donde el contacto entre los usuarios es más rápido y podrá lograr resultados rápidamente.

(4) En cuanto a la **utilidad percibida**, animamos a los desarrolladores de pagos móviles, especialmente aquellos que aplican NFC, a concentrar sus esfuerzos, no sólo en destacar la utilidad de los pagos, sino en agregar valor a su uso, implementando técnicas de experiencia de usuario (UX) e ir más allá de las expectativas de los consumidores teniendo en cuenta que la UX representa un cambio emergente en el concepto mismo de usabilidad, donde el objetivo no es solo mejorar el desempeño de la interacción del usuario (efectividad, eficiencia y facilidad de aprendizaje), sino resolver el problema estratégico de la utilidad del producto y la cuestión psicológica de la gratificación y el placer de su uso (D'Hertefelt, 2000).

Finalmente, realizamos algunas consideraciones específicas de cada sistema de pago estudiado. En cuanto a los pagos con códigos QR:

(1) Aunque los códigos QR ofrecen diversas ventajas, como la conveniencia y facilidad de uso, el conocimiento en el país donde se llevó a cabo el estudio (España) es aún reducido, de manera que los usuarios no están familiarizados con esta tecnología. Así que recomendamos realizar un esfuerzo en la información sobre **su existencia** y beneficios.

(2) Las **ventajas** de los códigos QR como tecnología de pago móvil deben ser ampliadas, en el interés común de los actores involucrados con el desarrollo de herramientas de pagos móviles, así como los comercios y usuarios finales.

(3) Se recomienda que los interesados en aumentar el uso de los pagos con QR, se focalicen en los usuarios con un mayor nivel de interacción con las nuevas tecnologías, incentivándolos a usar este sistema de pago. Los usuarios que disfrutan probando nuevas tecnologías pueden ser un gran aliado a la hora de difundir un servicio como este en el mercado (Rogers, 2003).

(4) También es importante tener en cuenta otros factores que, a pesar de tener un

impacto menor, tienen cierta importancia en el proceso de pago QR a través de teléfonos móviles. Estos factores incluyen la seguridad percibida y la calidad del propio sistema de pago (Lim, 2003) e incluso los actores existentes en el entorno tecnológico actual (Dahlberg, Mallat, Ondrus, & Zmijewska, 2008).

(5) Si bien en nuestro estudio la **seguridad percibida** no ha mostrado una influencia significativa sobre la actitud hacia el uso, eso no quiere decir que los usuarios no den relevancia a la seguridad del sistema. Más al contrario consideramos que probablemente se trate de un requisito mínimo que dan por incorporado mucho antes de pensar en adoptar la tecnología (Pousttchi, 2014). De esta manera es de suma importancia que las empresas mejoren sus criterios de seguridad para que los usuarios tengan confianza en el sistema.

En relación con los pagos por SMS:

(1) Al realizarse el estudio comparativo entre la adopción del pago por SMS y por NFC se ha encontrado que las personas tienen percepciones más positivas hacia este último.

(2) Se recomienda una ampliación de las ventajas asociadas a este medio de pago, tanto para los interesados en fomentar los pagos móviles como para los usuarios. En particular, parece necesaria una mejora en la percepción y la opinión general sobre esta herramienta de pago.

(3) En este caso la **seguridad percibida** sigue siendo un factor fundamental para la adopción por parte de los consumidores. De esta manera todos los actores involucrados con el desarrollo de los pagos móviles por SMS deben implementar medidas de seguridad relevantes para reducir el riesgo percibido por el consumidor. Para llevar esto a cabo las empresas deben acentuar la noción de seguridad de estos sistemas de pago a través de la publicidad, a través de sellos de calidad de seguridad e incluso haciendo uso de marcas asociadas (VISA o PayPal, por ejemplo).

En relación con los pagos por NFC:

(1) Las empresas deben desarrollar maneras **seguras y fiables** para la realización de transacciones de pagos móviles con NFC. Este es un aspecto que ha

demostrado ser relevante para los usuarios a la hora de adoptar este tipo de pago tanto en Brasil como en España.

(2) El potencial de los pagos mediante NFC parece ser mucho mayor que el de los pagos con SMS. En el caso de España, se ha encontrado una actitud mucho más positiva hacia este tipo de pago.

(3) En el caso del mercado brasileño, se recomienda centrarse en los usuarios que están más familiarizados con las nuevas tecnologías y proporcionarles información sobre la utilidad del sistema de pago NFC.

(4) Es muy importante utilizar herramientas de marketing para informar a los usuarios sobre la utilidad del sistema para realizar y controlar gastos, su compatibilidad con el estilo de vida de los usuarios y su seguridad para realizar transacciones financieras.

(5) En el caso del mercado brasileño, se debe atender a otros factores menos significativos que son, sin embargo, centrales en el proceso de adopción del pago con móviles. Este es el caso de la facilidad de uso y de la seguridad, o incluso, como sugieren Dahlberg *et al.* (2008), de los elementos mismos del entorno tecnológico actual. Además, siendo las evaluaciones iniciales de los usuarios brasileños positivas, las empresas deben ser conscientes del desarrollo que este sistema puede tener, incluso en el corto plazo.

8.3 Limitaciones y futuras líneas de investigación

Este es uno de los primeros trabajos en presentar un análisis diversificado de la aceptación del pago móvil, incluyendo diferentes herramientas de pago. No obstante, varias limitaciones reducen el alcance de estas conclusiones, abriendo, a su vez, la posibilidad de desarrollar futuras líneas de investigación que vengan a superar dichas limitaciones.

- Los estudios desarrollados para componer esta tesis doctoral no incluyeron interacción alguna entre el usuario y el sistema de pago, y fueron desarrollados en países con un nivel incipiente de aceptación. Lograr una **interacción real** con el sistema implica el uso de un dispositivo móvil y un comercio adherido en el cual se pueda realizar la compra. La introducción de un ambiente experimental de este tipo habría aumentado la complejidad de la investigación.
- Se realizaron muestreos por conveniencia, no probabilísticos. De esta forma,

los resultados obtenidos deben ser tratados con las debidas cautelas en cuanto a su potencial generalización a las poblaciones estudiadas.

- En los cuatro estudios se realizaron estudios transversales, por lo que no se realizaron seguimientos del comportamiento del usuario en el medio o largo plazo. Un enfoque de estudio longitudinal, podría verificar la robustez de las relaciones y constructos establecidos, con el fin de estudiar, desde una perspectiva temporal, la evolución de los efectos moderadores de las variables de género, edad y experiencia de usuario.

Para acabar, considerando tanto los resultados obtenidos como las limitaciones ya descritas, proponemos un**a serie de futuras líneas de investigación** sobre la intención de utilizar nuevos sistemas de pago electrónico:

- La replicación de estos estudios en otros países pertenecientes a diferentes ámbitos culturales y con diferentes niveles de desarrollo tecnológico, con el objeto de analizar posibles diferencias en los factores determinantes de la adopción de estos sistemas de pago.
- La comparación con otros sistemas de pago, incluyendo otras tecnologías móviles que comienzan a ponerse a disposición del mercado como alternativa, también, a las tarjetas de débito.
- La realización de estudios de carácter longitudinal y que incorporen un diseño experimental, de manera que se pueda analizar de manera efectiva el resultado de la manipulación de algunas de los factores clave en la adopción de estos sistemas (utilidad percibida, facilidad de uso percibida, seguridad percibida) en el comportamiento de pago real.
- La incorporación de potenciales **efectos moderadores** de factores como el género, la edad e incluso la experiencia con herramientas de pago similares. De la misma manera se deberían incorporar otras variables que parecen también relevantes para el proceso de adopción de nuevas tecnologías, como la experiencia con pagos electrónicos u otros sistemas de pago móvil.

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CHAPTER 8

CONCLUSIONS

The previous pages present four empirical studies related to the intention of consumers toward the use of mobile payments. In this chapter, the main conclusions, as well as the main academic contributions, are presented in a global and unified form. In addition, this chapter advances the more significant implications for industry regarding the development and adoption of mobile payments. Finally, this chapter points out a series of study limitations, as well as future lines of mobile payment research.

7.1 Main conclusions

Although the first attempts to implement viable mobile payment services linking consumers and businesses (B2C) was initiated more than a decade ago, no payment solution developed so far has been particularly successful (Pousttchi, Schiessler & Dietmar, 2009). However, important advances in the last two years have resulted in a more receptive market therefore raising the potential to spread application of this type of payment tool is now greater than in the past. Hence many markets already have specific regulations for this type of service and large banks and technology companies offer mobile payment solutions. Moreover, the use of technologies such as NFC and QR codes are already of common use by companies and specific segments of consumers.

Yet perhaps the major challenge for the final spread of mobile payments is their massive adoption by consumers. This doctoral thesis focuses specifically on providing keys to the factors that accelerate the adoption process by analyzing different aspects of mobile payments from the consumer point of view. The aim is to reinforce the knowledge base for future research, as well as provide relevant information for companies and developers of B2C payment systems.

Each of the four empirical studies presented in the previous chapters complement each other, and are behind the four models related to adopting mobile payments (M1, M2, M3 and M4). They include a variety of factors and offer a series of conclusions on the attitude of consumers toward these types of tools. Table 14 and 15 summarize the four studies, their objectives and main findings.

Table 21 - Summary of the content of the four studies

STUDY 1	Objectives	Main findings
User Behaviour in QR Mobile Payment System: The QR Payment Acceptance Model (QRPAM)	Analyze the acceptance of a new mobile payment system through QR codes by mobile phone users and determine the factors that determine their use.	The most directly influential variables in the intention to use in order of importance: ATT, PIIT and SN. The variable that is not directly significant in the intention to use: IM.
		The most directly influential variable in the attitude toward usage: PU The variables not directly significant in the attitude toward usage: IM, PS, PC, PEOU, SN.
		The relationship between PEOU and PU is revealed as the 3rd strongest of the model.
STUDY 2		
Intention to Use New Mobile Payment Systems: A Comparative Analysis of SMS and NFC Payments	Analyze consumer acceptance of the NFC and SMS mobile payment systems from the point of view of the behavioral model and determine their constituent factors.	The most directly influential variables in the intention to use SMS m-payment in order of importance: ATT, PU, SN and PS.
		The most directly influential variables in the intention to use NFC m-payment in order of importance: ATT, SN, PU, PS.
		The differences detected between the SMS and NFC mobile payment systems reinforce the idea that the behavior of the consumer will differ depending on the type of mobile payment system as seen by the difference in intensity of the different constructs.
		This study identified significant differences between payment types in the levels between SN and IU, PU and ATT, PEOU and PU, and finally, PEOU and ATT.
		All of the above relationships are stronger for NFC payments, with the exception of the relationship between PEOU and ATT, which has been non-significant for NFC payment and quite significant for SMS payment adoption.
STUDY 3		
Acceptance of NFC Technology for Mobile Payments: A Brazilian Perspective	Analyze acceptance by consumers of the NFC mobile payment system in Brazil based on a behavioral model that includes determinants for the acceptance of technology whose	The most directly influential variables on the intention to use listed in order of importance: ATT, PIIT, SN and PS. The variable not directly significant in the intention to use: IM.
		The most directly influential variables in the attitude toward usage listed in order of importance: PC and PU. The variables not directly significant in the attitude toward usage: IM and PEOU.

	main factor of acceptance is the intention to use	The relationship between PIIT and PEOU, and SN and PEOU, are shown as the 4th and 5th strongest relationships of the proposed model.
STUDY 4		
Exploring the Effects of Mobile Services on m-Payments adoption	Study how the offer of additional mobile services can increase the adoption of mobile payments and determine the role of personal innovation in the context of mobile payments adoption.	Predictive power of intention to use mobile payment: 28%; in the behavioral intention to use: 53.5%.
		The most directly influential variables on the intention to use listed in order of importance: the interest in using discount coupons, tickets, loyalty programs, personalized information, social networks and shopping lists. The variables not directly significant in the intention to use: the interest in using entertainment and rating services.
		The most directly influential variables in the behavioral intention to use listed in order of importance: IU, the interest in using loyalty programs, entertainment, LBS (location based services) and ticketing. The variables not directly significant in the intention to use behavior: the interest in using coupons, shopping list, product information, personalized information and rating
		Multi-group analysis with the different levels of PIIT indicate that there are differences in the IU →BI relationship. The intention has a stronger effect on the intention to use behavior in individuals with a lower level of personal innovation than those with a higher level.
		Individuals with a lower level of innovation are more motivated to use the mobile payment if they are offered some kind of mobile service in addition to the payment, while people with a high level of innovation do not have their behavior very affected by this type of benefit, and are possibly more motivated by other aspects of mobile payment such as the technical characteristics of the payment system (usability and adaptability).

IU: intention to use m-payments; ATT: Attitude towards usage of m-payments; PU: Perceived usefulness; PEOU: Perceived ease of use; SN: Subjective norms; PIIT: Personal Innovativeness in Information Technology; IM: Individual mobility; PC: Perceived Compatibility; PS: Perceived Security; BI: Behavioral Intention to use m-payments

Table 22 - Comparison of the summaries of the relations of the three studies

Relations			M1	$M2_{SMS}$	$M2_{NFC}$	M3
Predictive power of the Intention to use m-payment			64%	56%	65%	71%
ATT	→	IU	0.971***	0.273***	0.375***	0.751***
SN	→	IU	0.247*	0.119**	0.353***	0.160***
PIIT	→	IU	0.244*	-	-	0.482***
IM	→	IU	n.s.	-	-	n.s.
PC	→	ATT	n.s.	-	-	0.188***
PS	→	ATT	n.s.	-	-	-
PEOU	→	ATT	n.s.	0.213***	n.s.	n.s.
IM	→	ATT	n.s.	-	-	n.s.
PU	→	ATT	0.692***	0.475***	0.955***	0.638***
SN	→	ATT	n.s.	-	-	-
PC	→	PU	0.349***	-	-	0.302***
PEOU	→	PU	0.471***	0.272***	0.500***	0.267***
PIIT	→	PU	n.s.	-	-	n.s.
IM	→	PU	n.s.	-	-	0.188***
PIIT	→	PEOU	0.235***	-	-	0.393***
PU	→	IU	-	0.162**	0.336***	-
PS	→	IU	-	0.065**	0.078**	0.092**
SN	→	PEOU	-	0.336***	0.407***	0.326***
SN	→	PU	-	0.474***	0.390***	n.s.
PS	→	PU	-	-	-	n.s.

Note: (1) M4 was not included in this table because it does not include any relationship between variables that is comparable to the relationships included in the other models. The conclusions of this study are presented in the following pages. (2) *** p-value ≤ 0.001; ** p-value ≤0.05; * p-value ≤0.10. (3) n.s. The relationship between variables is not significant; (4) - The relationship between variables was not included in the model.

The papers are innovative, the first to: [1] analyze empirically the determinants of consumer acceptance of QR payments without reverting solely to the TAM as a theoretical base (M1, M2 and M3), [2] carry out an empirical analysis comparing consumer acceptance of SMS and NFC (M2) payments, [3] study the adoption of NFC mobile payments with a Brazilian sample (M3), and [4] explore the integration of mobile services of marketing as a motivator of the use of mobile payments, and determine the role of personal innovation in the adoption of the mobile payment in this context (M4).

The four models proposed in this doctoral thesis reveal the great **predictive power** of intention to use. The model for the QR payment system (M1) explains 64%, the model for SMS and NFC ($M2_{sms/nfc}$) payment systems explains about 56% and 65% respectively, and the model applying only for the NFC payment system (M3) explains 71%. These values are higher than those of analogous technology acceptance models (Lu, Yao, & Ye,

2005; Lu, Yang, Chau, & Cao, 2011; Yang, Lu, Gupta, Caso, & Zhang, 2012). Finally, model M4 offers a very satisfactory predictive power with a 53.5% of behavioral intention to use.

All the models including the attitude toward usage (ATT) of mobile payment (M1, $M2_{sms/nfc}$ and M3) indicate that this is the most influential direct variable in the intention to use and essential for the increase of the intention and subsequent use of the proposed mobile payment system (β=0.917, $p \leq 0.001$; β_{sms}= 0.273, $p \leq 0.001$; β_{nfc}= 0.375, $p \leq 0.001$; β = 0.751; $p \leq 0.001$). The power of the attitude factor stands out probably because users of the new technologies most commonly show curiosity and are predisposed to their acceptance.

Subjective norms (SN) as a social element directly reinforcing the intention to use a mobile payment tool through QR, NFC or SMS codes proved to be decisive in future adoption in the research consulted in this doctoral thesis (M1: β=0.247, $p \leq 0.001$; $M2_{sms/nfc}$: β_{sms}= 0.119, $p \leq 0.01$; β_{nfc}= 0.353, $p \leq 0.001$; M3: β= 0.160; $p \leq 0.01$). In addition, subjective norms also played an important role in consumer perceived usefulness ($M2_{sms/nfc}$: β_{sms}= 0.474, $p \leq 0.001$; β_{nfc}= 0.390, $p \leq 0.001$) and perceived ease of use ($M2_{sms/nfc}$: β_{sms}= 0.336, $p \leq 0.001$; β_{nfc}= 0.407, $p \leq 0.001$ y M3: β=0.326, $p \leq 0.01$). This is due to the current great interconnectivity between individuals due to the rapid and growing development of mobile communication technologies as well as the widespread use of virtual social networks. This implies that users take into account the opinions of individuals that are important to them.

Perceived usefulness (PU) represents an important effect in the attitude toward usage of mobile payment in all the models consulted in this work (M1, $M2_{sms/nfc}$ and M3). PU showed the strongest effect is on $M2_{sms/nfc}$ and the second strongest effect in M1 and M3. The results indicate the appropriateness of perceived usefulness in adoption of mobile payment systems research. In addition, the combination of Personal Innovativeness and Perceived Usefulness by future users proves to be a winning combination for adoption for the NFC and QR code mobile payments in Brazil and in Spain.

Perceived security (PS), analyzed only the first three articles (M1, $M2_{sms/nfc}$ and M3), plays a distinct role. While its effect on the attitude toward usage in the first (M1) is not significant, in $M2_{sms/nfc}$ and M3 it has a significant effect on the intention to use (β_{sms}= 0.065, $p \leq 0.01$; β_{nfc}= 0.078, $p \leq 0.01$; β= 0.092; $p \leq 0.05$). Hence, in spite of its low direct influence on intention to use, it is important to include it in mobile payment

adoption studies since consumers with higher levels of PS will be more likely to accept the new systems.

Personal innovation (PIIT) also proved to be relevant for future use of mobile payments in the M1 and M3 studies where it reveals a significant relationship between intention to use and perceived ease of use. This indicates that users with a higher level of personal innovation are more likely to accept QR and NFC mobile payments. This variable has an even greater importance in the intention to use NFC payment among future users of Brazil. These results reaffirm Rogers's Theory of Diffusion (2003) which states that generally the first to adopt innovations are individuals who are more open to new technologies and more accustomed to technological change. By consequence, these individuals serve as a reference to their social environment providing continuity to the adoption process. In addition, **personal innovation** has proven to be an important moderating variable to analyze differences in behavior. This is gleaned from M4 that advances that the comparison of groups of individuals with different levels of innovation shows the existence of different interests that affect behavioral intention (BI) of mobile payment use when they are integrated with additional services.

Perceived compatibility (PC) was included in two of the models included in this doctoral thesis (M1 and M3) and has also been shown to be significant, especially regarding perceived utility (M1: $\beta = 0.349$; $p \leq 0.001$; M3: $\beta = 0.302$; $p \leq 0.01$). In the case of the relation of PC with attitude toward usage, it is significant in the case of the NFC system ($\beta = 0.188$; $p \leq 0.01$), but not in the QR code payment ($\beta = 0.040$; $P = 0.453$). These findings indicate that when the system is compatible with the lifestyle of future users and their ways of making purchases of products and services, the perception of utility of the system will increase leading to a greater ease of adoption of NFC mobile payment.

In concordance with the findings of Davis (1989), the most significant relationship of **perceived ease of use** (PEOU) is with perceived usefulness. Its relation with the attitude toward usage of the tool in three of the models is non-significant (M1: $\beta = -0.022$; $p = 0.735$; M2: $\beta_{nfc} = -0.078$, $p = 0.088$; M3: $\beta = 0.073$; $p = 0.141$). Its only significant relationship with the attitude toward usage of SMS payment ($\beta_{sms} = 0.213$, $p \leq 0.001$). These results indicate that, although the perceived ease of use has no direct influence on the attitude toward usage of the payment tool with NFC and QR, it does play an important role in the perceived usefulness of all the studied payment systems.

The issue of **individual mobility** variable (IM) is pursued in two studies (M1 and M3). Of the three relationships proposed in both models (with intention to use, attitude toward usage and perceived usefulness), only the relation with perceived usefulness of NFC payments in Brazil (M3: $\beta = 0.188$, $p \leq 0.001$) was significant. These findings are probably a result of the high degree of mobility of the sampled populations which are fairly homogeneous in terms of the use of mobile phones and other relatively new technologies. Hence it is possible that this variable, since it is common to the entire population, is not important in predicting behavior.

The variables used to measure the **interest in using additional services** to the mobile payment (Coupons, Shopping list, Product information, Entertainment, Social Networks, Personalized information, Tickets, LBS, Ratings, loyalty programs) proved to be significant as they play an important role in the intention to use and, by consequence, in the adoption of this means of payment (M4). In particular, it was noted that mobile payments can be adopted more quickly when the m-payment system integrates loyalty and ticketing programs. However, the integration of Rating services does not reinforce the intention.

7.2 Implications for management

In order to achieve massive adoption, it is essential to adopt multiple perspectives in a field such as the commercialization and promotion of mobile payments where technologies and services advance at a lightning rate. Hence consumer perspective and perception of mobile payment tools is crucial.

The results presented here focus on end-user acceptance of the proposed payment systems and provide a set of recommendations and implications relevant to companies interested in promoting the use of mobile payments. These consists mainly of payment solutions that process financial operations via SMS, NFC or QR Codes.

The last study (M4) did not refer to a specific mobile payment solution, as its main objective was to explore the role of the offer of additional services in adopting mobile payments and how the different levels of PIIT impact adoption. The results lead to the following recommendations:

(1) Players in the mobile payment ecosystem should continue to look for ways to develop value for consumers through payment systems rather than traditional means. In this sense, the offer of other mobile services in addition to mobile payment systems can increase the perceived benefits by consumers and

retailers, as it creates a great opportunity to intensify the B2C relationship.

(2) Some mobile services, such as loyalty programs and gift tickets, hold a higher level of attention among consumers. The idea of being rewarded for making mobile payments is widely valued by consumers and appears to be the best way to encourage future use.

(3) Consumers hold different views on the value of additional m-payment services. Individuals with low PIIT levels are more attracted to the demand for mobile service integration than those with higher levels.

(4) Although this study reveals that individuals with a low level of innovation show greater interest in m-payment services, it must be highlighted that they are less able to handle complex systems (Rodrigues, José, Coelho, Melro, Ferreira, Monteiro, & Ribeiro, 2014). We therefore recommend that mobile payment system developers seek to balance the number of integrated services and, if they decide to include several tasks when making the payment, they maintain speed and simplicity.

Three variables were found to be especially significant regarding the M1, M2 and M3 studies. These are **attitude toward usage, subjective norms** and **perceived usefulness**. The following implications presented below should be taken into account by all those interested in developing and promoting the use of mobile payment tools with SMS, NFC and QR codes:

(1) The key to adopting such an innovative method as mobile payments requires a change of mindset and attitude, and more specifically, a shift in the use of credit cards and cash to mobile phones. However, it is essential to bear in mind that mobile payments require a complex network of relationships among a great number of actors (especially in their offer of financial services to the less favored section of the population) as well as strong governmental and global regulation (Diniz, De Albuquerque & Cernev, 2011).

(2) In light of these results, companies should focus on actions to improve user attitudes toward the use of this technology (providing information on the benefits through advertising, promotions, etc.) to increase the willingness to adopt it. These activities will promote positive attitudes toward payment systems and a successful transmission of their utility thus improving intended use.

(3) The **influence of the social environment** on consumption decisions is universal in all cultures and countries and may be amplified by the increased use of virtual social networks and the constant search by the consumer for information and recommendations before purchasing a product or service. In fact, many companies in order to secure an advantageous position and exploit future synergies already revert to social networks. In the case of the study of mobile payment adoption, subjective norms have also demonstrated an important role. We therefore, believe that it is vital that companies interested in promoting mobile payments influence the current social and technological environment of the consumer mainly through virtual social media (Liébana-Cabanillas, 2012).

Companies should also control the social environment in consumer buying behavior through an appropriate promotional activity and promote all the benefits of mobile payment in social networks where there is swift contact between users resulting in more prompt results.

Regarding **perceived usefulness**, we encourage mobile payment developers (especially NFC), to focus their efforts not only on highlighting its utility but on adding value to its use. They should implement user experience techniques (UX) and go beyond consumer expectations by acknowledging that the UX represents an emerging change in the concept of usability where the objective is not only to improve the performance of user interaction (effectiveness, efficiency and ease of learning), but to solve the strategic problem of the utility of the product as well as the psychological question of gratification and pleasure (D'Hertefelt, 2000).

To conclude, we consider some specific aspects of each payment system. Regarding mobile payments with QR codes:

(1) Although QR codes offer the advantages of convenience and ease of use, knowledge of them in Spain is still limited. We therefore recommend making an effort in gathering information about **their existence** and benefits.

(2) The **advantages** of QR codes in mobile payment technology should be broadened in the common interest of the players involved with the development of mobile payment tools, as well as merchants and end users.

(3) It is recommended that those interested in increasing the use of QR code payments should target users with a higher level of interaction with new

technologies and encourage them to adopt this payment system. Users who enjoy testing new technologies can serve as important allies when it comes to the spread of the service on the market (Rogers, 2003).

(4) It is also important to take into account other factors that despite their minor impact have an effect on the QR mobile phone payment process. These include perceived security of the quality of the payment system itself (Lim, 2003) as well as the current players in the present technological environment (Dahlberg, Mallat, Ondrus, & Zmijewska, 2008).

(5) Although **perceived security** regarding QR code payments does not betray a significant influence on the attitude toward usage, users are nonetheless aware of the relevance of the system's security. Moreover, we surmise this aspect to be a minimum requirement that users take for granted long before considering adopting technology (Pousttchi, 2014). Consequently, it is of utmost importance that companies improve their security criteria to bolster confidence among users.

Regarding mobile payments with SMS:

(1) The findings of the comparative study between adopting either SMS or NFC payments indicate that the NFC system generates more positive perceptions.

(2) We therefore recommend offering an extension of the advantages associated with this mean of payment to users as well as those interested in promoting these mobile payments. There is a clear necessity, in particular, to improve the perception and general opinion of this payment tool.

(3) In this case p**erceived security** remains a key factor in consumer adoption. Thus all the actors involved in the development of SMS mobile payments must implement relevant security measures to reduce consumer perceived risk. To carry this out companies should stress the notion of the security of these payment systems through advertising, security quality stamps and even resorting to associated brands (VISA or PayPal, for example).

Regarding mobile payments with NFC:

(1) Companies must develop **secure and reliable** ways to conduct these mobile payment transactions. This is an aspect that has proven to be relevant for users when adopting this type of payment both in Brazil and in Spain.

(2) The potential of NFC payment system seems much greater than SMS. Findings in the case of Spain reveal a much more positive attitude toward usage of this mobile payment.

(3) It is recommended, in the case of the Brazilian market, to focus on users who are more familiar with new technologies and provide them with information on NFC payment's usefulness.

(4) It is of prime importance to use marketing tools to inform users about the usefulness of the system to carry out payments and control expenses, its compatibility with user lifestyle, and its security.

(5) Other less significant factors that are central to the mobile payment adoption process should be addressed specifically for the Brazilian market. This is the case of perceived ease of use and security, or even, as suggested by Dahlberg et al. (2008), the elements of the current technological environment. In addition, since there is a positive initial evaluation from Brazilian users, companies should be aware of the development that this system can have, even in the short term.

7.3 Limitations and future lines of research

This is one of the first studies presenting a diversified analysis of mobile payment acceptance with reference to different payment tools. Yet several limitations reduce the scope of these conclusions, opening up the possibility of developing future lines of research so as to overcome the deficiencies.

(1) The studies undertaken in the framework of this doctoral thesis did not include interaction between the user and the payment system. Moreover, they were developed in countries with an incipient level of acceptance. Achieving a **real interaction** with the system requires the use of a mobile device and a business affiliated with the system where the purchase is made. The introduction of an experimental environment of this type could have increased the scope of this research.

(2) Samples were of the convenience type (not probabilistic). Thus the results must be treated with due caution as to the potential general application for the studied populations.

(3) Cross-sectional analyses studies were carried out in each of the four studies. Hence there has been no follow-up of the user's behavior in the medium or

long term. A longitudinal approach could test the robustness of the relationships and constructs in order to explore, from a temporal perspective, the evolution of the moderating effects of the variables of gender, age and user experience.

To conclude, considering both the results and the limitations previously described, we propose a **series of future lines of research** on the intention to use new electronic payment systems:

- Replication of these studies in other countries with different cultures and levels of technological development in order to analyze the potential differences in the determinants of payment system adoption.
- Comparison of these systems with other payment procedures including mobile technologies that are beginning to be available in the market as an alternative to debit cards.
- Conducting longitudinal studies and incorporating an experimental design so that the result of the manipulation of some of the key factors in the adoption of these systems be effectively analyzed (perceived usefulness, perceived ease of use, perceived security) in actual payment behavior.
- Incorporating potential **moderating effects** factors such as gender, age and even experience with analogous payment tools. In the same way, other variables that appear to be relevant to the process of adopting new technologies, such as experience with electronic payments or other mobile payment systems, should also be incorporated.

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