Document ERPB CTLP 70-15
Version 1.1
Date: 5 November 2015

ERPB FINAL REPORT
MOBILE AND CARD-BASED CONTACTLESS PROXIMITY PAYMENTS

Abstract	This document presents the final report on mobile and card-based contactless proximity payments.
Document Reference	ERPB CTLP 70-15
Issue	Version 1.1
Date of Issue	5 November 2015
Reason for Issue	Final report to ERPB meeting 26 November 2015
Produced by	ERPB CTLP Working Group

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Executive Summary

This final report provides the outcome of the work conducted by the ERPB Working Group on mobile and card based contactless proximity payments from January 2015, following the mandate given by the ERPB meeting in December 2014 (see Annex 1), until November 2015.

In order to gain a better insight into these types of payments, the Working Group decided to conduct a landscaping exercise through a survey amongst Working Group participants. The survey focused on the existing or planned mobile and card based contactless proximity payment solutions; on the appropriate technical and security specifications and guidelines, on the related existing and planned regulations and recommendations and last but not least on the issues and barriers that may prevent the development and the adoption of pan-European solutions for these types of payments.

The survey results highlighted that the market is fragmented in terms of maturity of the contactless solutions adoption and the related technical standards implementations. Likewise, the mobile proximity payments environment shows strong complexities, mainly related to the usage of different technologies and the large number of business stakeholders involved in the mobile ecosystem.

Based on the results of the survey and subsequent inputs received, the Working Group specified an overall vision for these payments in the European Union. It further derived from the survey the barriers and gaps which need to be addressed towards the realisation of that vision. The feedback, based on the 49 inputs received may be found in Annex 4, with an indication if they are in the competitive or cooperative space. The Working Group subsequently identified and prioritised a number of main barriers and gaps. For each prioritised barrier, this report provides an issue description based on the inputs received as well as related key observations made through an analysis by the Working Group. These have formed the basis for the development of the following recommendations, to be taken in order for the essential conditions in the cooperative space to materialise towards the realisation of the vision.

#	Addressee(s)	Rationale	Recommendations	Deadline
A	EMVCo	Multiple standards with a variety of options are currently present in the market. The rationale is to streamline the standards used in the industry.	i. Speed up the creation of a single common POI kernel specification for contactless (already planned under Next Generation) and make the specifications publicly available as soon as possible. ii. Limit the number of terminal configuration options into the EMV Next Generation specifications, in order to allow consistency among implementations and therefore provide consumers a streamlined payment experience across different terminals. iii. Include in the Next Generation specifications a parameter that would allow the identification of	the latest Dec 2016

				the form factor of the consumer device used for the initiation of the contactless transaction.	
B	Card Scheme Sector	Aligned Card Scheme requirements and the promotion of the adoption of open protocols in the POI domain will ease the take up of contactless payments.	i.	Define an aligned European mandate for the implementation of contactless enabled POIs including a specification of where they should be available. The ECB should act as facilitator for this.	mid 2016
			ii.	Harmonise the level of transaction limits at POI at country level for payments per use case / payment context.	on-going
			iii.	Request the usage of open protocols in the POI domain and the POI to Acquirer domain which are compliant to the Cards Standardisation Volume and labelled by the Cards Stakeholders Group.	mid 2017 Dec 2017
			iv.	Mandate a common implementation plan for the EMVCO Next Generation specifications with an appropriate migration period[1].	
C	Cards Stakeholders Group	The standardisation of open specifications for a card and mobile contactless payment application, could allow payment application developers and card manufacturers to reach economy of scales and would	i.	Develop common requirements for contactless transactions for inclusion in the Cards Standardisation Volume Version 8.	Dec 2016
			ii.	Conduct a feasibility study on the development of open specifications for a card and mobile contactless payment application, their implementation, maintenance and testing. For mobile applications, the open specifications should also address the different possible configurations for the management, provisioning and personalisation of the card data: Secure Element	Dec 2016

[1] This would also cover the identification of the form factor used for the initiation of the contactless transaction, see Recommendation A.

		lower the cost of these items for the Issuers, fostering contactless adoption. The specification of common POI implementation guidelines will lead to a more uniform payment experience, for both the consumer and merchant	(UICC, Embedded, SD Card) and HCE. The future specifications should leverage the work of EMVCo and Global Platform. iii. Develop use cases/payment contexts for contactless payments (card and mobile based) for integration in Cards Standardisation Volume Version 8. iv. Develop POI implementation guidelines including common minimum requirements for contactless POIs (both for the payment process side and for the consumer/POI interface) hereby leveraging the EMVCo work and addressing the requirements of disabled people associations. Adequate usage of available input should be made (see for instance [DNF1], [EAN1], [GIRO1] and [UKC2] in Annex 6).	Dec 2016 Dec 2016
D	EPC, Consumer and Retailers Associations	Enhance society awareness on contactless payments	Coordinate in co-operation with the Card Schemes an institutional communication campaign of the ERPB members to increase the familiarity with contactless payment products (card and mobile based). The communication campaign should result in the creation and distribution of informative material on contactless payment solutions and their usage to all the ERPB members and affiliates. Moreover ERPB members and the ECB are requested to make the informative material produced available on their websites. This communication material should include the following topics: • how to use contactless (both from a consumer and a retailer perspective); • highlight the improved payment experience for the consumers; • choice of application for	mid 2016

			contactless payments; • explain the benefits of using contactless; • address consumer concerns (privacy, safety, security, freedom of choice, etc…); • training material for retailer staff.	
E	Public Admin. and Transport Sector where card payments are suitable	The adoption of contactless payments by certain sectors has proven to be an important catalyst and is even critical for their take-up in various countries.	Prioritise the installation and use of POI terminals which are enabled to accept EMVCo based contactless transactions.	on-going
F	ETSI	The standardisation of a generic secure platform for the mobile device and of complementary processes will contribute to the cost-effectiveness with respect to the development, certification and implementation of mobile proximity payment services.	i. Agree and put forward the development of the specifications of a "Smart Secure Platform" (enabling the provision of value-added services relying on authentication of the user, regardless of the mobile device, communication channel and underlying technology) taking into account the requirements for mobile payments, hereby leveraging work already done by EMVCo and Global Platform. ii. Develop implementation guidelines thereby leveraging work already done by Global Platform that define: o a process to provide the service providers with the credentials to have access to secure elements o a process that allows a service provider to be authenticated, to securely get the credentials to access mobile device's hardware	White paper mid 2016 Specific. Dec 2017 Dec 2016

			vaults (e.g. the secure element) and to communicate with these vaults.	
G	Mobile Payment Providers	Promote the usage of a generic secure platform for the mobile device	Require the mobile devices to be qualified according to the future work developed by the ETSI "Smart Secure Platform" (see Recommendation F).	Dec 2018
H	GSMA	Provide clarity on NFC enabled mobile device evaluation / certification processes	i. Develop an overview paper on the functional and security evaluation / certification of NFC enabled mobile devices (covering all aspects and configurations #SE types, HCE, TEE, etc…) in co-operation with Global Platform and EMVCo. More in particular issues related to contactless interference issues should be addressed. ii. Encourage European MNOs to promote the sales of NFC enabled equipment.	mid 2016 on-going
I	Mobile Device Manufacturers, Mobile OS Developers and GSMA / MNOs	Consumer independence of mobile device for the freedom of choice on mobile contactless payment services	Provide access to the mobile device contactless interface in order to ensure that the consumer can have a choice amongst payment applications from different mobile payment providers, independently of the mobile device and the operating system used.	on-going
J	European Commission, Regulators and the Cards Stakeholders Group	Address legal issue for the potential negative impact it could have on the take-up of contactless payments	To work together to ensure a consistent understanding on "the choice of application" in the IF Regulation (see [8]) and to address the impact that it could have on contactless payments. Hereby the impact analysis undertaken by the Cards Stakeholders Group (see Annex 8) should be taken into account.	mid 2016

Table 1: Recommendations

0 Document information

0.1 Structure of the document

This section describes the structure of this final report. Section 0 provides the definitions, and abbreviations used in this document. The scope of the work is provided in section 1. Section 2 contains a description of the methodology and survey used to gather the information represented in this report. The vision for mobile and card-based contactless proximity payments is specified in Section 3. Section 4 portrays the current situation with respect to the actual implementations or planned implementations of these types of payments through the description of country clusters. Section 5 is devoted to the description of the barriers and gaps prioritised by the ERPB Working Group which were identified through the survey. It further contains key observations related to these barriers which have been used as basis to specify the recommendations presented in Section 6.

Annex 1 presents the ERPB Mandate while Annex 2 shows the composition of the ERPB Working Group. The survey used for the preparation of this report is provided in Annex 3. Annex 4 represents the outcome on the barriers and gaps identified through the survey. Annex 5 lists the legal and regulatory requirements identified which impact these payments while Annex 6 provides the technical and security references for these payments. Annex 7 provides some country profiles as typical examples for the implementation of contactless payments. Annex 8 provides the outcome of the impact analysis of the IF Regulation on contactless payments conducted by the Cards Stakeholders Group.

0.2 References

This section lists the references mentioned in this document. Square brackets throughout this document are used to refer to a document of this list.

Ref.	Title
[1]	EMVCO specifications http://www.EMVCo.com
[2]	Global Platform TEE System Architecture http://www.globalplatform.org/
[3]	ISO/IEC 14443: Identification cards -- Contactless integrated circuit cards -- Proximity cards – Parts 1-4. http://www.iso.org
[4]	ISO/IEC 18092: Information technology -- Telecommunications and information exchange between systems -- Near Field Communication -- Interface and Protocol (NFCIP-1). http://www.iso.org
[5]	ISO 20022: Financial Services - Universal financial industry message scheme – Parts 1-8. http://www.iso.org
[6]	Payment Services Directive Directive 2007/64/EC of the European Parliament and of the Council of 13 November 2007 on payment services in the internal market.
[7]	Payment Service Directive 2

	Draft Directive of the European Parliament and of the Council on payments services in the internal market and amending Directives 2002/65/EC, 2013/36/EU and 2009/110/EC and repealing Directive 2007/64/EC
[8]	IF Regulation Regulation (EU) 2015/751 of the European Parliament and of the Council of 29 April 2015 on interchange fees for card-based payment transactions.

Table 2: References

0.3 Definitions

The following terminology is applied in this document. The abbreviations used may be found in section 0.4.

Term	Definition
2D barcodes	A two dimensional barcode is a machine-readable optical label that contains digital information. They are also referred to as matrix barcodes. Examples include QR codes and tag barcodes.
Acquirer	A PSP or one of their agents that enters into a contractual relation with a merchant and an issuer via the card payment scheme, for the purpose of accepting and processing card transactions.
Authentication	The provision of assurance of the claimed identity of an entity or of data origin.
Bluetooth low energy (BLE)	A wireless personal area network technology designed and marketed by the Bluetooth Special Interest Group aimed at novel applications including beacons. Compared to classic Bluetooth, BLE is intended to provide considerably reduced power consumption and cost while maintaining a similar communication range.
Card Payment Scheme	A card payment scheme is a technical and commercial arrangement (often referred to as the "rules") between parties in the card value chain, resulting in a set of functions, procedures, arrangements, rules and devices that enable a consumer (cardholder) to perform a payment transaction, and/or cash withdrawal or any other card service. The members of the card scheme can issue or acquire transactions performed within the scheme.
Consumer	A natural person who, in payment service contracts covered by the [6], is acting for purposes other than his trade, business or profession (as defined in [6]).
Consumer Verification Method	A method for checking that a consumer is the one claimed.
Contactless Technology	A radio frequency technology operating at very short ranges so that the user has to perform a voluntary gesture in order that a communication is initiated between two devices by approaching them. It is a (chip) card or mobile payment acceptance technology at a POI device which is based on ISO/IEC 14443 (see [3]).
Contactless Card Payment	A card based proximity payment where the payer and the payee communicate directly using contactless technologies.
Customer	A consumer or a merchant.
Credential(s)	Payment account related data that may include a code (e.g., mobile code), provided by the issuer to their customer for

	identification/authentication purposes.
Digital wallet	A service accessed through a consumer device which allows the wallet holder to securely access, manage and use a variety of services/applications including payments, identification and non-payment applications. A digital wallet is sometimes also referred to as an e-wallet.
EMVCo	An LLC formed in 1999 by Europay International, MasterCard International and Visa International to enhance the EMV Integrated Circuit Card Specifications for Payments Systems. It manages, maintains, and enhances the EMV specifications jointly owned by the payment systems. It currently consists of American Express, Discover, JCB, MasterCard, Union Pay and VISA (see [1]).
Host Card Emulation (HCE)	A technology that enables mobile devices to emulate a contactless card. HCE does not require the usage of a secure element for storage of sensitive data such as credentials, cryptographic keys, …
Issuer	A PSP or one of their agents that supplies the card payment account and the card services (including card data) to the cardholder, and is a member of a card payment scheme. The Issuer enters into a contractual relationship with a consumer (cardholder) and guarantees payment to the acquirer for transactions that are in conformity with the rules of the relevant card payment scheme.
Merchant	The beneficiary within a mobile payment scheme for payment of goods or services purchased by the consumer/payer. The merchant is a customer of its PSP.
Mobile code	A user verification method used for mobile card payments. It is a code entered via the keyboard of the mobile device to verify the cardholder's identity as a cardholder verification method.
Mobile Contactless Payment (MCP)	A mobile proximity payment where the payer and the payee communicate directly using contactless technologies.
MCP application	An application residing in a secure environment performing the payment functions related to a Mobile Contactless Payment (MCP), as specified by the MCP application issuer in accordance with the payment scheme.
Mobile device	Personal device with mobile communication capabilities such as a telecom network connection, Wi-Fi, Bluetooth … which offers connections to internet. Examples of mobile devices include mobile phones, smart phones, tablets.
Mobile Network Operator (MNO)	A mobile phone operator that provides a range of mobile services, potentially including facilitation of NFC services. The MNO ensures connectivity Over the Air (OTA) between the consumer and its PSP using their own or leased network.
Mobile payment service	Payment service made available by software/hardware through a mobile device.
(Mobile) proximity payment	A (mobile) payment where the consumer and the merchant (and/or their equipment) are in the same location and where the communication between the consumer device (card or mobile device) and the Point of Interaction device takes place through a proximity technology (e.g., contactless including NFC, 2D barcodes, BLE, etc.). (Mobile) proximity payments include but are not limited to (mobile) contactless payments. Contact card payments are excluded.

Mobile service	Service such as identification, payment, ticketing, loyalty, etc., made available through a mobile device.
Mobile wallet	A digital wallet accessed through a mobile device. This service may reside on a mobile device owned by the consumer (i.e. the holder of the wallet) or may be remotely hosted on a secured server (or a combination thereof) or on a merchant website. Typically, the so-called mobile wallet issuer provides the wallet functionalities but the usage of the mobile wallet is under the control of the consumer.
NFC (Near Field Communication)	A contactless protocol specified by ISO/IEC 18092 [4].
Payment account	Means an account held in the name of one or more payment service users which is used for the execution of payment transactions (see [6]).
Payment Service Provider	The bodies referred to in Article 1 of the [6] and legal and natural persons benefiting from the waiver under Article 26 of the [6].
Payment transaction	An act, initiated by the consumer of placing, transferring or withdrawing funds (as defined in [6]).
POI device	"Point of Interaction" device; the initial point where data is read from a consumer device or where consumer data is entered in the merchant's environment. As an electronic transaction-acceptance product, a POI consists of hardware and software and is hosted in acceptance equipment to enable a consumer to perform a payment transaction. The merchant controlled POI may be attended or unattended. Examples of POI devices are Point of Sale (POS), vending machine, Automated Teller Machine (ATM).
Secure Element (SE)	A certified tamper-resistant platform (device or component) capable of securely hosting applications and their confidential and cryptographic data (e.g., key management) in accordance with the rules and security requirements set forth by a set of well-identified trusted authorities. Examples include universal integrated circuit cards (UICC), embedded secure elements, chip cards and secure digital cards.
Secured Server	A web server with secure remote access that enables the secure storage and processing of payment related data.
Trusted Execution Environment (TEE)	An execution environment (as defined by Global Platform, see [2]) that runs alongside, but isolated from a main operating system. A TEE has security capabilities and meets certain security-related requirements: it protects TEE assets from general software attacks, defines rigid safeguards as to data and functions that a program can access, and resists a set of defined threats.
User Interface (UI)	An application enabling the user interactions.

Table 3: Terminology

0.4 Abbreviations

Abbreviation	Term
2D barcode	Two dimensional barcode
BLE	Bluetooth Low Energy
C2B	Consumer-to-Business
C2C	Consumer-to-Consumer
ETSI	European Telecommunications Standards Institute

GP	GlobalPlatform
GSMA	The GSM Association
HCE	Host Card Emulation
HSM	Hardware Security Module
MCP	Mobile Contactless Payment
MNO	Mobile Network Operator
NFC	Near-Field Communications
OS	Operating System
OTA	Over the Air
POI	Point of Interaction
PSD	Payment Services Directive
PSP	Payment Service Provider
QR code	Quick Response code
SE	Secure Element
TEE	Trusted Execution Environment
UI	User Interface

Table 4: Abbreviations

1 Scope

The scope for this report on mobile and card based contactless proximity payments was specified in the mandate given in December 2014 by the ERPB (see Annex 1) to the dedicated Working Group (see Annex 2 for its composition).

The main goal is to address issues related to the muted take up of mobile and card based contactless proximity payments. Several innovative payment solutions rely on contactless technologies to perform payments or on proximity technologies to initiate payments. They usually provide a more convenient user experience at the point of interaction (POI) and a substantially faster check-out. Even though these types of payments are still at an early stage of development, there is already a trend towards setting standards that differ across schemes, devices and countries. The purpose of the work it to analyse existing solutions and standards (both national and international) and assess to what extent there are differences in standards and technical implementation preventing interoperability at pan-European level.

This final report contains a vision for mobile and card based contactless proximity payments in the European Union, the analysis of the market conditions and a set of recommendations. These recommendations identify concrete actions to be taken in the cooperative space in order to realise the essential conditions to materialise the vision.

2 Methodology

Throughout the first semester of 2015 the participants to the ERPB Working Group on mobile and card based contactless proximity payments gathered and analysed information related to these payments. A dedicated survey (see Annex 3) amongst the participants of the Working Group was organised to collect this information.

The aim of this survey was to provide input on the following topics:

A. Existing or planned mobile and card based contactless proximity payment solutions;
B. Existing or planned white papers and technical and security specifications / standards related to mobile and card based contactless proximity payments;
C. Existing or planned regulations and recommendations / guidelines on mobile and card based contactless proximity payments, including security and privacy aspects;
D. Issues or barriers that may prevent the development of pan-European solutions.

In total 57 responses to the survey have been received, representing 25 countries both from the demand and the supply side. The input received on existing and planned mobile and card based contactless proximity implementations is reflected in section 4.

Based on the inputs received, the Working Group specified an overall vision for mobile and card based contactless proximity payments in the European Union which is presented in section 3. It further derived from the survey the barriers and gaps which need to be addressed towards the realisation of that vision. The feedback, based on the 49 inputs received on the barriers and gaps identified through this survey, is contained in Annex 4, with an indication if they are in the competitive or cooperative space. The Working Group subsequently prioritised a number of main barriers and gaps and specified for each barrier related key observations (see section 5). These barriers and key observations have formed the basis to develop concrete recommendations including guidelines and actions to be taken in order for the essential conditions in the cooperative space to materialise towards the realisation of the vision.

3 Vision

The Working Group defined the vision for mobile proximity and card based contactless payments in the European Union as follows:

"To ensure over time, across Europe, a secure, convenient, consistent, efficient and trusted payment experience for the customer (consumer and merchant) for retail transactions at the Point of Interaction (POI), based on commonly accepted and standardised contactless and other proximity payment technologies."

This vision is based on the following guiding principles:

- Technical interoperability of contactless and other proximity transactions across Europe (based on common technical, functional and security standards and certification / evaluation framework) both for consumer devices (cards, mobile devices, wearables, …) and POIs;
- Wide availability and usability of appropriate POI equipment and consumer devices;
- Appropriate security and privacy to build up and maintain trust.

This should lead to an enhanced payment experience - faster check out, user-friendliness, better integration of value added services with payment - and to cost-effectiveness for Society.

4 Contactless and other proximity implementations in Europe

This section portrays the current situation with respect to the actual implementations of mobile and card based contactless payments through the description of country clusters. Focus has been given to this type of payments since they appear to be the most mature proximity payments in the market.

However, it should be noted that different countries have also implemented other types of proximity payments, mostly based on QR codes, however, most of them appear to be closed, proprietary solutions which do not operate cross-border.

4.1 Some "contactless" payment statistics

Given that the European market shows a heterogeneous level of consumer adoption of electronic payment instruments across countries and, considering as well that different paces and approaches are noted for the adoption of contactless payments, the present report presents a European payment market analysis conducted at country level, where fewer differences occur.

With the objective to streamline the definition of guidelines and strategies aimed to expand the usage of mobile and card based contactless payments, the WG identified groups of countries that show similar levels of usage of contactless payment solutions and defined them as country clusters. The criteria adopted to define these country clusters are the usage of card payments and the presence and usage of contactless solutions (mainly card based). The WG used both the ECB payment statistics data and the contributions of their participants.

As the level of presence of card payments in a country was identified as an important factor with respect to the possible take-up of contactless payments in view of the existing card payment infrastructure and customer habituation (consumer and merchant), a first criterion which was analysed was the number of card[2] payment transactions. Hereby, three segments were defined in relation to this criterion, namely "low", "medium" and "high" as follows:

Level	Number of card transactions per capita
Low	< 75 transactions per year (an average of circa 1,5 transactions per week)
Medium	between 75 and 150 transactions per year (an average of between 1,5 and 3 transactions per week)
High	> 150 transactions per year (an average of more than 3 transactions per week)

Table 5: Definition of levels of card transactions per country

The table below summarises the result of the segmentation exercise based on the 2014 figures provided by the ECB for the first criterion.

[2] Debit, Credit, Deferred debit.

Ref year 2014	Population (million)	Total Card Transactions (million)	Card Transactions per capita (units)	Level
Austria	9	559	65	low
Belgium	11	1,508	135	medium
Bulgaria	7	65	9	low
Czech	11	484	46	low
Denmark	6	1,516	269	high
Germany	82	3,335	40	low
Estonia	1	247	187	high
Ireland	5	435	94	medium
Greece	11	88	8	low
Spain	46	2,760	59	low
France	66	9,438	143	medium
Croatia	4	218	51	low
Italy	61	2,034	33	low
Cyprus	1	40	47	low
Latvia	2	191	96	medium
Lithuania	3	172	59	low
Luxembourg	1	102	182	high
Hungary	10	359	36	low
Malta	0	19	45	low
Netherlands	17	3,169	188	high
Norway	5	1,890	369	high
Poland	38	1,873	49	low
Portugal	10	1,274	123	medium
Romania	20	228	11	low
Slovenia	2	140	68	low
Slovakia	5	273	50	low
Finland	5	1,331	244	high
Sweden	10	2,620	270	high
UK	65	13,010	201	high

Table 6: Card transactions per country

As second criterion the total numbers of contactless transactions versus the total numbers of face to face card transactions were analysed, defining a penetration percentage per country. Four segments were defined in relation to this criterion as shown in the table below whereby every country was classified in accordance to the data gathered from the ERPB WG participants.

The table below summarises the result of the segmentation exercise based on the second criterion.

	Transaction Penetration < 3%	Transaction Penetration 3% - 9%	Transaction Penetration 10%-50%	Transaction Penetration >50%
Markets	Belgium Bulgaria Cyprus Denmark Estonia Finland Germany Greece Italy Latvia Lithuania Luxemburg Malta Norway Portugal Romania Slovenia Sweden	Austria Croatia France Ireland Netherlands Spain	Hungary Poland Slovakia UK	Czech Republic

Table 7: Contactless transactions penetration (Q2 2015)

The combination of these two indicators can be used to define five different clusters of countries with respect to the take-up of contactless payments. The clusters identified are labelled as follows: “Developed”, “In development”, “Movers”, “Slow movers” and “Last Movers”. The table below provides a brief description of the different clusters.

Labels	Country cluster description
Developed	The consumers in the countries assigned to this cluster present a consolidated usage of contactless payments. These markets are pioneering the payment innovation and the consumer adoption of contactless payments is massive. It is driving a consistent increase in the total number of card-based transactions.
In development	The consumers in the countries assigned to this cluster present a medium usage of contactless payment and the market stakeholders are actively pursuing the implementation of contactless solutions despite the fact that consumers in these payment markets are not strongly accustomed to using card payments. Consumer adoption of contactless payments is often mainly concentrated in metropolitan areas. It is driving a noticeable increase in the total number of card-based transactions.
Movers	The consumers in the countries assigned to this cluster present a medium level of usage of contactless payments in a market where consumers are already accustomed to using card payments. Consumer adoption of contactless payments is increasing fast and is driving a consistent increase in the total number of card-based transactions.
Slow movers	The consumers in the countries assigned to this cluster present a low level of usage of contactless payments. On the other hand these markets are among the most developed in terms of card and electronic payments usage. The introduction of contactless solutions has not been recognised yet as a factor for further development of consumer payment behaviour.
Last Movers	The consumers in the countries assigned to this cluster present a low level of usage of contactless payments in a market that is also less developed in terms of card payments usage. The introduction of contactless solutions might be a factor for further development of consumer payment behaviour and number of card-based transactions.

Table 8: Definition of country clusters for contactless payments

The next table presents the result of the clusterisation analysis of country markets based on the previously defined labels in Table 8 and using the criteria of Tables 6 and 7:

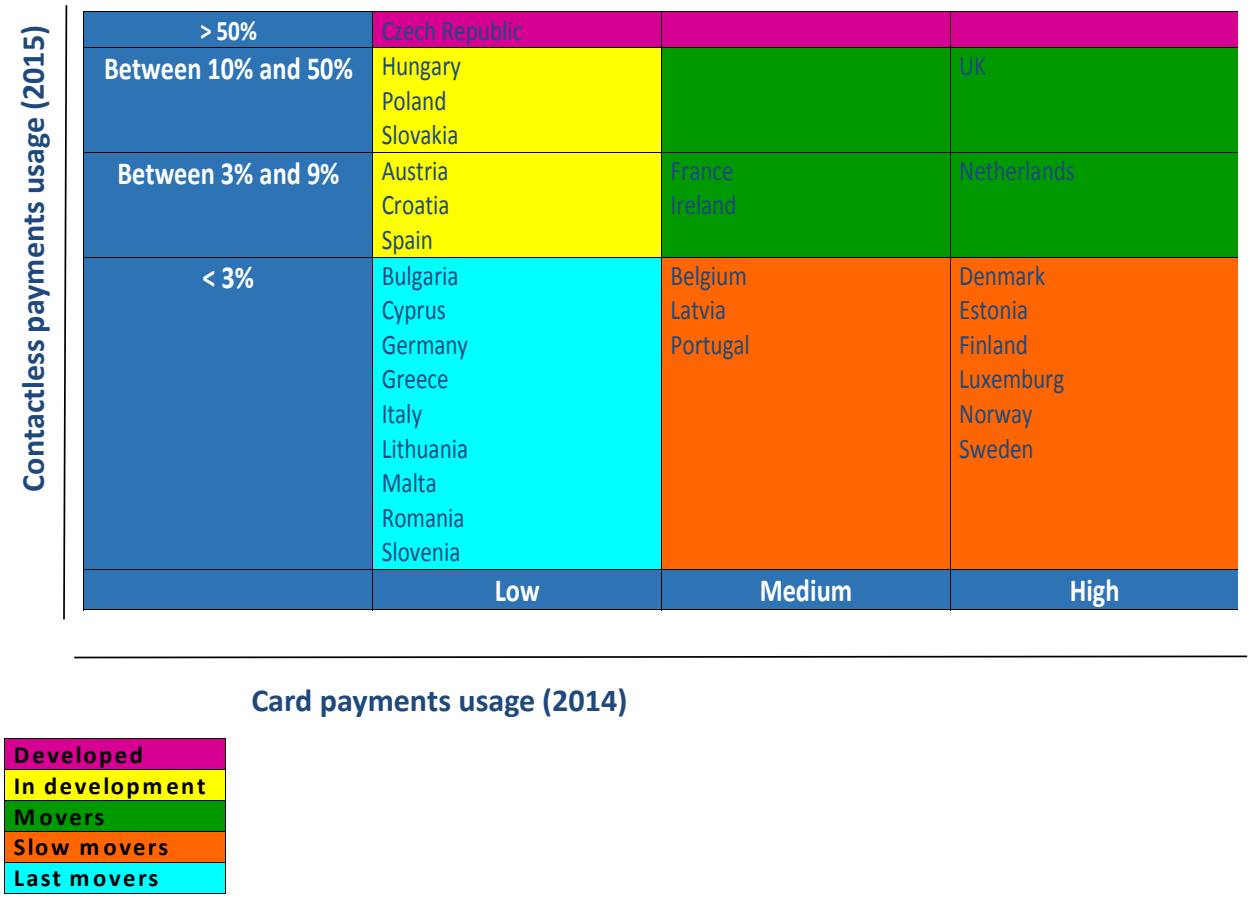

Table 9: Country clusters for contactless payments

An additional indicator for the take-up of contactless payments is the proportion of contactless cards and active contactless enabled POIs versus the total number of cards and POIs. The table below shows the actual contactless infrastructure penetration grid based on Q2 2015 figures obtained from the ERPB WG participants.

Contactless cards	Low acceptance penetration (< 10%)	Medium acceptance penetration (10%-50%)	High acceptance penetration (> 50%)
High issuance penetration (>50%)		Austria France Ireland Netherlands	Czech Republic Poland Slovakia
Medium issuance penetration (10%-49%)	Denmark Luxembourg Portugal Norway	Bulgaria Croatia Cyprus Finland Germany Greece Italy Romania Slovenia	Hungary Spain UK
Low issuance penetration (<10%)	Belgium Latvia Sweden		

Issuance penetration: percentage of contactless enabled cards within all cards issued

Acceptance penetration: percentage of activated contactless enabled POIs within all POIs

Table 10: Contactless infrastructure penetration (Q2 2015)

4.2 Some lessons learnt

Next to the statistics provided in the previous section, it is also interesting to have a closer look to some specifics of countries which have introduced contactless payments over the past years. As an example, a closer analysis has been made on Poland and the UK with the purpose to derive some key findings with respect to increasing the speed of the introduction and usage of contactless payment. A detailed description of these two country profiles may be found in Annex 7.

The key findings derived may be described as follows

- **The importance of central coordination in the country:**
  The central coordination between the different (even competing) stakeholders involved, in the launch of a pilot and further roll-out of contactless payments has played a key role in the smooth implementation in certain countries. It has allowed for a more consistent customer experience, a coordinated retailer approach, issuance of supporting documentation at country level (e.g. the UK guidelines for POIs, see [UKC2] in Annex 6), the prompt common handling of issues detected, and last but not least cost-effectiveness.

- **The contactless transaction amount limit:**
  The common agreement by all stakeholders involved in the market roll-out of contactless payments in a country on the transaction amount limit without the presentation of a consumer verification method (e.g. PIN or mobile code) and subsequent monitoring on the transaction behaviour and impact has proven to considerably influence the take-up of contactless payments. As an example, the UK has increased the transaction amount limit for a third time.

In Poland only recently transactions above the limit can be conducted contactless with the presentation of a consumer verification method (e.g. PIN at POI or mobile code at mobile device) where before a contact card transaction was required.

- **The involvement of certain sectors: large retail stores, transport/transit sector:**
  The take-up of contactless payments by major retailers (e.g. groceries) and the transit sector has given a great boost to contactless payments. Indeed, the fact that consumers daily make use of these services has considerable contributed to their habituation to and embracement of contactless technology. Moreover, the usage by the transit sector of EMV-based contactless technology in certain countries like the UK, rather than developing their own solution, had a direct impact on the usage scale of these payments and obviously led to cost-effectiveness.

- **Merchant staff training**
  The appropriate training of merchant staff is recognised as a key factor for the consumer experience in the retail shops. Not only appropriate knowledge of how a contactless transaction needs to be handled but also regular asking consumers to pay contactless should be part of the staff education. This training could be accompanied by appropriate promotion campaigns (e.g. “tap & go”).

- **Consumer communication and awareness**
  The combined usage of various means of communication to consumers is important. This could include explaining the feature in the welcome call, in the welcome pack, statement insert, ATM screens, dedicated campaigns to support contactless payments and promotional messages mainly for customer education where for instance the measured contactless speed and facts are included.

5 Main barriers for the realisation of the vision

The survey reflected that nowadays the market has considerably matured with respect to card contactless payments, largely based on the EMVCo specifications, while it appears to be still early days for mobile proximity payments, including mobile contactless payments. Concerning the latter, NFC seems to be the widest adopted technology nowadays for mobile proximity payments (in analogy to contactless card payments) although also other technology solutions have been introduced to initiate mobile proximity payments such as 2D barcodes, beacons, ... It should be noted that for the latter, the underlying payment instrument may not be a card payment.

The survey highlighted the presence of barriers and gaps for the different types of payments in scope. In view of their market maturity, less barriers and gaps have been identified for contactless card payments compared to mobile proximity payments. It is generally expected that the creation of the necessary conditions for removing these barriers might be easier for card based contactless payments than for mobile based proximity payments.

Below in section 5.1 follows a list of the barriers which were prioritised as being valid for both contactless card and mobile proximity payments, while section 5.2 presents a list of additional barriers dedicated to mobile proximity payments.

5.1 Barriers for proximity payments

5.1.1 Lack of a common (open) set of specifications and implementation guidelines for proximity payments transactions

Issue description

The lack of a complete common set of (open) specifications and implementation guidelines for proximity payment transactions, - both card and mobile device based - creates differences across Europe in proximity payment products and in customer (both consumer and merchant) experience which hinder technical interoperability and prevent cost-effectiveness for Society.

More in particular, the survey identified the following issues for mobile and card based EMV contactless payments which should be addressed through standardisation work:

- Multiplicity of acceptance implementation options creating issues at the POI (e.g. PIN on line not supported, TAP + mobile code + TAP not supported, etc.);
- Difference in implementation between online and offline transactions in different geographies in Europe may lead to an inconsistent consumer experience (and missed business opportunities for merchants and PSPs);

In addition, the following specific issues for standardisation (in random order) related to mobile proximity payments were reported through the survey:

- Lack of interoperability of existing acceptance infrastructure (accepting NFC and 2D barcodes on the same POI).
- Time at check-out with POI should be at least as fast as with a card payment;
- Lack of standardisation in the payment initiation message for new proximity technologies such as 2D barcodes[3] or BLE;
- Lack of standards for the enrolling in digital wallets;
- The absence of standard procedures to personalise card data into secure elements;
- The presence of multiple consumer verification methods (no PIN, PIN at POI, mobile code, fingerprint,…) leading to non-interoperable solutions and consumer confusion;
- Co-existence of multiple mobile contactless payment applications on multiple secure elements, cloud, host card emulation, etc. need to be addressed in a consistent manner to ensure optimal consumer experience.

Key observations

Within the card and mobile based proximity payments environment, the standardisation work for EMV contactless payments is already well-advanced and implemented, especially with regards to the interaction between the POI and the consumer device (either card or mobile device). Some improvements may be identified to further enhance the customer experience and solve some interoperability issues as noted through the survey. On the opposite, for other proximity payment techniques (such as 2D barcodes, BLE, etc.) there are no (open) common specifications yet and existing proximity technologies and standards are not yet widely known in the payment industry.

The most prevalent technology on the market nowadays for contactless payments is based on NFC and employs the EMVCo specifications (see [1]). EMVCo is already working on the next generation of their specifications which aim to unify the requirements for all payment contexts, covering both

[3] Note that the EPC published guidelines on the usage of QR codes for the initiation of a SEPA credit transfer (EPC 069-12) but not for the specific usage in a mobile environment.

contact and contactless card transactions through a single specification for the POI kernel (currently multiple kernel specifications exist – to date 7 have been registered by EMVCo). The final version of these specifications, referred to as "EMV Next Generation" are planned to be released by end 2016.

The implementation of EMV Next Generation specifications could be part of a solution to create a level playing field through standardisation in the cards-to-POI and in the POI application domains. This process might be further complemented with the development of common minimum security requirements for the contactless payment application and of specifications for the POI-to-acquirer domain, the latter being addressed by other organisations such as Nexo. The migration to a single protocol in the POI-to-acquirer domain would allow moving away from domestic, proprietary protocols which hinder cross-border interoperability and would result in an improved cost-effectiveness. Simplifying the access to the card acquiring market via the standardisation of contactless card environment related specifications enhances competition.

There are EMV and Global Platform specifications for personalising card data into secure elements that could be referenced in a set of standard personalisation procedures.

The lack of commonality between EMV implementations within Europe (e.g. some countries support online PIN, others do not) could be addressed through the development of implementation guidelines.

Complementary to the development of implementation guidelines specifications and requirements, appropriate existing testing, evaluation and certification processes should be revisited and potentially further developed to meet these new requirements which should be resulting in a "unified" certification framework.

5.1.2 Lack of customer demand and contactless payment experience

Issue description

A lack of familiarity makes it difficult for customers (both consumers and merchants) to employ contactless payments. Trust and confidence in these payments should be built by the industry leveraging the advantages of these solutions. The multiple solutions that exist in contactless payment products create some variations in the user experience. For example, different consumer devices can be used to initiate a contactless transaction (card, mobile, sticker, key fob, watch, etc.) and POIs may have different set-ups (see also section 3.5). Moreover, multiple consumer verification methods are available (PIN on POI, mobile code on mobile device, biometrics on mobile device or absence of any consumer verification methods, etc.). These variances contribute to the creation of a lack of clarity with regards to contactless payments and a lack of trust both from consumers and merchants. This affects the take-up of contactless payment products.

Key observations

Customers (both consumers and merchants) lack familiarity and trust with other form factors and technologies than contactless cards. The customer experience could be improved by defining standardised sets of rules and user interface requirements[4] for the different payment use cases and merchant environments which ultimately may result in a more consistent user experience across SEPA (see also section 5.1.5).

[4] In analogy to the document developed by the UK Cards Association with MasterCard and Visa on a *Contactless User Interface for Europe and the UK*, based on *EMV Contactless Specifications for Payment Systems – Book A: Architecture and General Requirements* (see [1]).

Furthermore, the consumer awareness should be increased through communication activities (with respect to liability, security, proximity habits, speed, etc.) by merchants and/or payment service providers, but possibly also through multi-stakeholder generic commercials. A coordinated communication effort by all stakeholders might effectively contribute to increasing the familiarity with contactless payment products. This would promote the market take-up of these solutions.

Finally to enhance the trust and confidence, the consumer should be provided with an opt-out to contactless products. How to achieve this is a PSP's implementation option.

5.1.3 Lack of ubiquity of POIs

Issue description
The payments market is a two-sided market. This means that for a payment product to become successful, it has to be frequently used by consumers on one side, but also widely accepted by merchants on the other side. A large part of the POI terminals in Europe today is not equipped for contactless transactions yet. The average merchant take-up of contactless POIs is slow because it is usually linked to the POI lifecycle (i.e. renewal of POIs) and the associated costs. The European market presents itself fragmented in that respect; in some countries the retailers already have a large percentage of POIs which support contactless technology while in other countries only a limited number of merchants with contactless POIs are available. As a consequence, consumers which have been provisioned with a contactless payment instrument are not always offered sufficient opportunities to use contactless technology. This hinders consumer and merchant habituation and ultimately leads to an even slower take-up of contactless payment solutions.

Key observations
A lack of availability of contactless POIs makes the uptake of contactless payments by consumers difficult. Note that this is not only matter of take-up by the retail sector but in some countries a lack of support from the acquirers for promoting, selling and deploying contactless POIs is to be noted.

Deployment of EMV compatible contactless POI terminals has been successful where coordination at country level took place (e.g. UK, Poland, and Czech Republic). A second success factor is the involvement of particular retail sectors, such as large grocery departments, were the consumer has a recurrent payment experience or the involvement of other consumer services such as public transport.

In order to enhance the availability of contactless POI terminals, some of the (international and domestic) card schemes have mandated in Europe the migration of the POI terminal base to support contactless technology.

Where legally possible, a further incentive could be created through the deployment of contactless technologies by public authorities and administrations in the respective countries in Europe. They may play an exemplary role in this by for instance accepting contactless payments related to public services such as specific tax and (local) administrative fees collections.

5.1.4 Security and privacy

Issue description
Various stakeholders have a general concern about the security and the privacy issues related to contactless payments. Additional risks are perceived from the introduction and the usage of contactless technology (e.g.; short range technology used in the communication between the consumer device and the POI creating an opportunity for electronic eavesdropping) and should be adequately addressed.

Also new risks associated with the usage of mobile devices (see also section 5.2.2), instead of physical cards, by the consumers pose new security challenges.

With regard to mobile proximity payments, payment credentials may be stored in new environments (such as hardware / software modules on the mobile device or back-end servers (clouds) accessed via the mobile device), each come with different security and privacy threats which need to be appropriately countered by security measures.

In case of security breaches, the appearance of subsequent fraudulent transactions may result in a lack of trust in contactless payments which in turn can hinder market take-up.

Key observations

With respect to contactless payments in general, it is very important to have an appropriate communication towards the customers to address privacy and data protection concerns, to inform about the security of the payment instrument and to explain how (exceptional) fraudulent transactions would be handled. This communication is important to create customer (both consumer and merchant) trust which is an important pillar for an increased market take-up of contactless payment products. Merchants also expressed the need for the identification of the form factor of the consumer device at the POI.

Privacy appears to be a bigger concern with mobile proximity payments than contactless card payments. The mobile environment is seen as more vulnerable than the card.

In particular, related to the security of mobile contactless payments, the SecuRe Pay Forum drafted a preliminary set of security recommendations in 2013. This work was handed over to the EBA as one of the potential inputs for the future development of guidelines and regulatory technical standards mandated within the PSD2 (see [7]).

Last but not least, in the mobile proximity payment ecosystem, which is far more complex than the contactless card ecosystem and which involves many more stakeholders, a same minimum level of security for each stakeholder in the payment chain should be ensured. At the same time, a relevant distribution of liabilities should be applied accordingly amongst these stakeholders.

5.1.5 Consumer interaction with POI

Issue description

Besides the lack of familiarity of consumers regarding contactless payment products in general which was mentioned in section 5.1.2, there still seems to be a lot of uncertainty when consumers face a POI and wish to perform a contactless payment: is the POI contactless enabled, where should I wave my consumer device (the POIs which are contactless enabled may have the contactless interaction point placed in different positions), has the payment been executed, do I get a receipt?

There are also accessibility issues concerning contactless POIs for people who are visually impaired or have a physical or mental disability or who are chronically ill. For example, the sound of the beep at the moment of contactless interaction is not loud enough, the palpability of certain keys is not good enough or the contrasting colors on the display make it difficult to read. These issues prevent certain groups of consumers to use contactless payment products.

Key observations
The development of common minimum requirements for contactless POIs, including a common symbol for the contactless spot, requirements on audio feedback and on the displays and keyboards to ensure that everyone in the society is able to use contactless payment products, may contribute to a more uniform payment experience. EMVCo has already undertaken some work in that respect with specifications for the POI user interface which are contained in the EMV Contactless Specifications for Payment Systems – Book A: Architecture and General Requirements (see [1]). However, the POI vendors have a number of choices within the specified requirements.

EMVCo has also developed two contactless marks: a contactless indicator (e.g. the consumer device) and a contactless symbol (e.g. for the POI) with licensing agreements and reproduction requirements which may be found in the "Best Practices" section on their website (see [1]).

5.2 Additional barriers for mobile proximity payments

This section provides a description of additional prioritised barriers which apply specifically to mobile proximity payments.

5.2.1 Fragmented and immature mobile technology landscape

Issue description
The market for mobile proximity payments is very fragmented with a lot of innovative but immature solutions. The fragmentation derives either from the presence of multiple mobile solutions with a limited geographical coverage or from the usage of different technologies, standards and business rules across the existing mobile solutions.

Mobile devices provide the payment industry with multiple technologies to initiate and/or perform payments. They have the capability to capture, store and transmit data in diverse and numerous ways.

The versatility of the mobile devices leave stakeholders in the ecosystem (including merchants, PSPs, Mobile Network Operators (MNO), other service providers, …) with major challenges with respect to the development of strategies / road maps with a viable business case and market reach.

Furthermore, being that the market for payment services is a multi-sided market, mobile proximity payments solutions should be simultaneously introduced and employed on the consumer and merchant sides. However, there is a lot of uncertainty how the market will develop and what will be the future prevalent technology solution.

Some initiatives in this area are leveraging the card contactless acquiring infrastructure, others are creating closed loop solutions with selected merchants, which are often subsidised for technology integration. In many counties domestic solutions with local protocols are being employed. This results in a large variety of solutions across Europe with no pan-European acceptance. Those solutions involve different technologies and infrastructures resulting in interoperability issues which are a main barrier for market integration. The market fragmentation is leading consumers and merchants to confusion and limited adoption of the existing solutions.

Key observations
New payment products are often promoted to a national audience rather than European level. In this situation similar solutions are developed and launched in different countries but unfortunately they are not always interoperable with each other. This creates market fragmentation in Europe. Market

fragmentation in turn makes it difficult for suppliers of payment products to reach scale economies, which in the payments market is a key factor for a business model to be successful.

The focus should be to develop basic standards for each of the mobile proximity technologies which can be addressed at this very moment in view of where the market is today. Taking into account that contactless payments are already much better adopted than other mobile proximity payments, it could be appropriate to further develop pan-European implementation standards for mobile proximity payments which are based on the EMVCo contactless specifications (see also 5.1.1).

It is also to be noted that the speed for adoption of card contactless payments has proven to be much quicker in countries (e.g.; UK, Czech Republic, Poland …) where a centralised coordination took place across payment market stakeholders with the support of the card schemes. A similar approach could be advisable for mobile proximity payments.

5.2.2 Complexity and security of mobile devices

Issue description

A mobile device may be considered as a quite complex piece of equipment with many different components, including the baseband, operating system, firmware, software, NFC controller, multiple external interfaces, possibly a Trusted Execution Environment (TEE) and one or multiple Secure Elements (SEs). Moreover, the production of these components involves different manufacturers before integration in the mobile device. This means that functional and security standards should be ensured throughout the whole production cycle. Also the presence of different software on the mobile device, developed by diverse vendors or service providers, poses a significant challenge to the integrity of the mobile device ecosystem.

It is also important to note that for providers of mobile contactless payment applications there is a strong dependency on the handset manufacturers and mobile OS providers, which is a highly competitive space with little cooperation on standardisation. Therefore they face a huge complexity with different solutions for each handset and/or mobile OS. This means that they need to develop their applications for a large number of different mobile platforms (combinations of different hardware and software) in view of the current platform incompatibilities. This obviously comes with a cost impact and may in some cases also lead to consumer confusion. The fact that there are multiple solutions on the market which are different - read not compatible - makes it challenging for the supply side. Moreover, once the devices are in usage by the consumer, there are a number of additional challenges which remain to be addressed; security and privacy are the most relevant ones.

Indeed, consumer trust in mobile proximity payments is strongly linked to security and privacy. Two aspects of security have to be considered, the first is the customer perceived security in the solution or in the system, the second is the level of security the solution has which is strongly linked to its cost and usability. Enhanced security often comes with additional costs while the user experience may be negatively affected.

The mobile device is exposed to threats in view of the many interfaces it has, including change of behaviour or incompatibility due to software upgrades, rooting (jail-breaking) of mobile phones, etc. The increased presence of malware on mobile devices has to be noted and should also be kept under careful consideration.

Finally, with regard to diversity and complexity, the consumers interact potentially with a multitude of user interfaces related to different payment solutions, adding a further layer of complexity.

Key observations
The security threats and risk models related to the usage of mobile devices for payments are different to the threats encountered for payments with contactless cards. Also the security features offered to counter the threats are different for contactless card payments compared to mobile proximity payments.

Security standards for mobile devices in support of mobile payments are not yet widespread nor adopted since the market is living its early days.

Some organisations have already developed specifications and standards for securing the mobile contactless payment environment. Furthermore, they have also created some testing and certification activities in accordance with those standards and specifications.

Nevertheless the payment industry is still missing an overall framework for the usage of mobile devices which addresses functionality, security and privacy. Such a framework could ensure a widespread adoption and usage of mobile devices for (proximity) payments. There is a need for the development of minimal security objectives / requirements for mobile devices (possibly through a layered standardisation approach) in support of mobile payments (which can be met by different technologies / implementations). A corresponding testing, evaluation and certification framework is needed for the stability and security of mobile devices as a platform for mobile payments throughout their lifecycle. In addition, appropriate consumer awareness is needed with respect to safeguarding the security of their mobile device.

5.2.3 Lack of ubiquity of appropriate mobile devices

Issue description
As mentioned before, the NFC based contactless technology is considered nowadays as the most promising one in terms of short and medium term development. The background for this is that consistent investments are currently on-going to update the hardware on the supply side (PSPs are issuing contactless enabled cards) and merchants are installing contactless POIs based on NFC technology.

Whilst this trend is noticeable, with different intensity in each European country, the introduction of mobile contactless payments still seems to suffer from a lack of availability of appropriate mobile devices supporting the NFC functionality. Moreover, within the group of NFC enabled devices still a minority of them is working with a mobile operating system supporting Host Card Emulation (HCE). To date only Blackberry OS7 or newer and Android Kit Kat 4.4 or newer support HCE. Microsoft announced the support of HCE in the mobile version of its Windows OS 10 later on in 2015.

Key observations
NFC based contactless technology is the most promising in terms of development in the short and medium term. Contactless NFC based solutions are gaining traction across several geographies in Europe, nevertheless this growth is mainly due to physical card based solutions.

The manufactures are gradually installing NFC hardware on the majority of the newly developed and on sale models for mobile devices.

5.2.4 Mobile competitive landscape

The mobile ecosystem has proven over the last decade to be a very competitive landscape whereby multiple services are accessed via the mobile device. This has come with a strong competition among

the different service providers on service levels and pricing. Mobile service providers are widening their offer to other services which are accessed via the mobile device, including payments. The mobile devices allow the co-existence of different payment solutions on a single device, even from multiple PSPs either using similar or different technologies.

A characteristic this landscape presents is that it transforms the commercial relationships between the consumers and PSPs and it changes the provisioning channel of the payment solutions.

Key observations

Currently it is unclear what will be the prevailing mobile proximity payment technology in the future, which results into difficult decisions with respect to investments to be made. It is precisely the competition between the different technologies that leads to a fragmented market.

However, there is a strong demand for more openness of the new solutions which are entering the market today to support competitiveness; examples are an open (but secure) and free access to the mobile device capabilities (including the NFC antenna, any component being it the SE or HCE).

With the objective of streamlining the consumer experience and facilitating payments, the industry supply side recently introduced wallet services. These services represent a breakthrough in the payment market; consumers have the opportunity of aggregating the payment service interfaces via the wallet together with other information (e.g., loyalty reward scheme accounts, etc.). The wallet supplier may be able to act as intermediary between the PSPs and the consumer; this could change the commercial position of the PSPs towards the consumer.

It has to be noted that numerous mobile offerings are gaining consumer attention, interest and preference. Nevertheless, consumer awareness on mobile device usage for payment services initiation is still low. The will from the payment supply side to conquer the consumer preference might lead into a movement towards the use of closed loop solutions, which could hinder widespread use of mobile proximity payments, potentially leading again to market fragmentation.

5.2.5 Regulatory framework

Issue description

Regulatory authorities can play an important role in taking away barriers in the payments market. However, excessive regulatory interference in the emerging and developing market of mobile proximity payments could lead to unintended consequences such as stifling innovation in an immature market or preventing the introduction of consumer focused services. Therefore it is important that new regulation provides room for innovations and supports new market developments

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Key observations

At the moment of publication of this final report, a recent European regulation directed to card payments is the Interchange fee regulation. Although it might be too early to judge the effect of this regulation, card based contactless payments are impacted in view of the requirements on the choice of application[5].

[5] A dedicated impact analysis has being conducted in the Card Stakeholder Group (CSG), see Annex 8.

There is a general concern among some market participants that (further) regulatory activity might disrupt consolidated business models, hamper the entrance of new players into the market and increase the costs associated with regulatory compliance.

5.2.6 Complexity of mobile ecosystem

Issue description

An increased number of stakeholders are involved in the ecosystem for mobile proximity payments compared to card payments in view of the complexity of the underlying infrastructure. At this time in Europe the infrastructure used for mobile payment services is build up by many different parties and components. This introduces new challenges from a business perspective. Next to the technical complexity of issuing and operating payment applications through mobile devices, there is a huge business complexity in view of the different and often new players involved in the value chain. Establishing a business model across them, sharing customer ownership and revenues are recognised to pose major challenges to the mobile payment ecosystem.

Key observations

The introduction of contactless card based solutions is easier and more straightforward compared to mobile contactless payment solutions because it involves the same stakeholders as in the legacy contact card ecosystem. The presence of additional business stakeholders in the mobile ecosystem (depending on the adopted technology and architecture) aiming to gain revenues and customer ownership results in an increased complexity of the overall business models. This condition impacts the market take up of the mobile contactless payment solutions but clearly resides in the competitive space.

6 Recommendations and guidelines

Based on the analysis for the prioritised barriers conducted in the previous section, the following recommendations have been specified. For each recommendation the intended addressee is listed, next to a deadline and mapping on the identified barriers as described above, a high level estimation is done on the impact of the implementation of the recommendation (High or Medium) on the identified barriers.

#	Addressee(s)	Rationale	Recommendations	Deadline	Barriers addressed	Impact
A	EMVCo	Multiple standards with a variety of options are currently present in the market. The rationale is to streamline the standards used in the industry.	i. Speed up the creation of a single common POI kernel specification for contactless (already planned under Next Generation) and make the specifications publicly available as soon as possible. ii. Limit the number of terminal configuration options into the EMV Next generation specifications, in order to allow consistency among implementations and therefore provide consumers a streamlined payment experience across different terminals. iii. Include in the Next Generation specifications a parameter that would allow the identification of the form factor of the consumer device used for the initiation of the contactless transaction.	the latest Dec 2016	5.1.1 5.1.2 5.1.4 5.1.5 5.2.1	High
B	Card Scheme Sector	Aligned card scheme requirements and the promotion of the adoption of open protocols in the POI domain will ease the take up of contactless payments.	i. Define an aligned European mandate for the implementation of contactless enabled POIs including a specification of where they should be available. The ECB should act as facilitator for this. ii. Harmonise the level of transaction limits at POI at country level for payments per use case /	mid 2016	5.1.1 5.1.2 5.1.3 5.1.5 5.2.1	Medium

			payment context.	on-going		
			iii. Request the usage of open protocols in the POI domain and the POI to Acquirer domain which are compliant to the Cards Standardisation Volume and labelled by the Cards Stakeholders Group.	mid 2017		
			iv. Mandate a common implementation plan for the EMVCO Next Generation specifications with an appropriate migration period[6].	Dec 2017		
C	Cards Stakeholders Group	The standardisation of open specifications for a card and mobile contactless payment application, could allow payment application developers and card manufacturers to reach economy of scales and would lower the cost of these items for the Issuers, fostering contactless adoption.	i. Develop common requirements for contactless transactions for inclusion in the Cards Standardisation Volume Version 8.	Dec 2016	5.1.1 5.1.2 5.1.4 5.1.5 5.2.1 5.2.2	High
			ii. Conduct a feasibility study on the development of open specifications for a card and mobile contactless payment application, their implementation, maintenance and testing. For mobile applications, the open specifications should also address the different possible configurations for the management, provisioning and personalisation of the card data: Secure Element (UICC, Embedded, SD Card) and HCE. The future specifications should leverage the work of EMVCo and Global Platform.	Dec 2016		
			iii. Develop use cases/payment contexts for contactless payments (card and mobile based) for integration in Cards Standardisation Volume	Dec 2016		

[6] This would also cover the identification of the form factor used for the initiation of the contactless transaction, see Recommendation A.

		The specification of common POI implementation guidelines will lead to a more uniform payment experience, for both the consumer and the merchant	Version 8. iv. Develop POI implementation guidelines including common minimum requirements for contactless POIs (both for the payment process side and for the consumer/POI interface) hereby leveraging the EMVCo work and addressing the requirements of disabled people associations. Adequate usage of available input should be made (see for instance [DNF1], [EAN1], [GIRO1] and [UKC2] in Annex 6).	Dec 2016		
D	EPC, Consumer and Retailers Associations	Enhance society awareness on contactless payments	Coordinate in co-operation with the Card Schemes an institutional communication campaign of the ERPB members to increase the familiarity with contactless payment products (card and mobile based). The communication campaign should result in the creation and distribution of informative material on contactless payment solutions and their usage to all the ERPB members and affiliates. Moreover ERPB members and the ECB are requested to make the informative material produced available on their websites. This communication material should include the following topics: • how to use contactless (both from a consumer and a retailer perspective); • highlight the improved payment experience for the consumers; • choice of application for contactless payments;	mid 2016	5.1.2 5.1.4 5.1.5 5.2.2	High

			• explain the benefits of using contactless; • address consumer concerns (privacy, safety, security, freedom of choice[7], etc…); • training material for retailer staff.			
E	Public Administrations and Transport Sector where card payments are suitable	The adoption of contactless payments by certain sectors has proven to be an important catalyst and is even critical for their take-up in various countries.	Prioritise the installation and use of POI terminals which are enabled to accept EMVCo based contactless transactions.	on-going	5.1.3 5.2.1	Medium
F	ETSI	The standardisation of a generic secure platform for the mobile device and of complementary processes will contribute to the cost-effectiveness with respect to the development, certification and implementation of mobile proximity payment services.	i. Agree and put forward the development of the specifications of framework, referenced as a "Smart Secure Platform" (enabling the provision of value-added services relying on authentication of the user, regardless of the mobile device, communication channel and underlying technology) taking into account the requirements for mobile payments, hereby leveraging work already done by EMVCo and Global Platform. ii. Develop implementation guidelines thereby leveraging work already done by Global Platform that define: o a process to provide the service providers with the credentials to have access to secure elements; o a process that allows a service provider	White paper mid 2016 Specifications Dec 2017 Dec 2016	5.1.4 5.2.1 5.2.2 5.2.3	Medium

[7] This means that the consumer should be given an option of opting out to contactless products.

			to be authenticated, to securely get the credentials to access mobile device's hardware vaults (e.g. the secure element) and to communicate with these vaults.			
G	Mobile Payment Providers	Promote the usage of a generic secure platform for the mobile device	Require the mobile devices to be qualified according to the future work developed by the ETSI "Smart Secure Platform" (see Recommendation F).	Dec 2018	5.1.4 5.2.1 5.2.2 5.2.3 5.2.4	Medium
H	GSMA	Provide clarity on NFC enabled mobile device evaluation/certification processes	i. Develop an overview paper on the functional and security evaluation / certification of NFC enabled mobile devices (covering all aspects and configurations #SE types, HCE, TEE, etc…) in co-operation with Global Platform and EMVCo. More in particular issues related to contactless interference issues should be addressed. ii. Encourage European MNOs to promote the sales of NFC enabled equipment.	mid 2016 on-going	5.1.4 5.2.1 5.2.2 5.2.3 5.2.4	Medium
I	Mobile Device Manufacturers, Mobile OS Developers and GSMA / MNOs	Consumer independence on mobile device for the freedom of choice on mobile contactless payment services	Provide access to the mobile device contactless interface in order to ensure that the consumer can have a choice amongst payment applications from different mobile payment providers, independently of the mobile device and the operating system used.	on-going	5.2.2 5.2.4 5.2.6	High
J	European Commission, Regulators and the Cards Stakeholders Group	Address legal issue for the potential negative impact it could have on the take-up of contactless payments	To work together to ensure a consistent understanding on "the choice of application" in the IF Regulation (see [8]) and to address the impact that it could have on contactless payments. Hereby the impact analysis undertaken by the Cards Stakeholders Group (see Annex 8) should be taken into account.	mid 2016	5.1.2 5.2.5	High

Table 11: Recommendations

In addition, the following specific guidelines are given for the clusters defined in section 4:

Clusters	Guidelines
Developed	The contactless payment stakeholders active in this cluster are encouraged to continue to focus on the expansion of the contactless acceptance network within their country and to achieve interoperability between the current acquiring infrastructure and the upcoming mobile based proximity payment solutions.
In development	The contactless payment stakeholders active in this cluster are encouraged to focus their efforts on the expansion of the contactless acceptance network within their country and to promote the consumer engagement and usage of card-based payments instruments via contactless on a wider audience of consumers.
Movers	The contactless payment stakeholders active in this cluster are encouraged to further promote the migration to contactless enabled acceptance infrastructure and the ownership of contactless enabled instruments (cards and mobile).
Slow movers	The contactless payment stakeholders active in this cluster are encouraged to promote the migration to contactless enabled acceptance infrastructure and the ownership of contactless enabled instruments (cards and mobile). The launch and the coordination of projects that promote the usage of contactless payment solutions in the field of public "transit" services is envisaged for the relevance it might have on increasing the contactless consumer adoption.
Last Movers	The contactless payment stakeholders active in this cluster are recommended to develop the contactless enabled acceptance infrastructure and the ownership of contactless enabled instruments (cards and mobile). The launch and the coordination of projects that promote the usage of contactless payment solutions in the field of public "transit" services is envisaged for the relevance it might have on increasing the contactless consumer adoption.

Table 12: Guidelines for the country clusters

Annex 1: Mandate of the ERPB Working Group on mobile and card based contactless proximity payments

Based on Article 8[8] of the mandate of the Euro Retail Payments Board a working group is set up with the participation of relevant stakeholders to address issues related to the muted take up of mobile and card based contactless proximity payments.

Scope: Several innovative payment solutions rely on contactless technologies to initiate payments or transfer payment related data in proximity payment situations. They usually provide a more convenient user experience at the point of sale and a substantially faster check-out. Even though these types of payments are still at an early stage of development, there is already a trend towards setting standards that differ across schemes, devices and countries. The purpose of the working group would be to analyse existing solutions and standards (both national and international) and assess to what extent there are differences in standards and technical implementation preventing interoperability at pan-European level.

Deliverables: The working group is expected to:

i. elaborate on a vision (define the 'what' we should achieve) for mobile and card based contactless proximity payments in euro;

ii. define the essential conditions for the realisation of the vision;

iii. distinguish between essential conditions that need to be addressed in the competitive and in the cooperative space; and

iv. identify concrete actions to be taken in order for the essential conditions in the cooperative space to materialise.

The form of communicating the findings and the recommendation of the working group is a report to the ERPB.

Time horizon: The working group is expected to start work in Q4 2014 and report its findings in Q4 2015. The group would then be dissolved.

Participants and chairmanship: Membership in the working group is open to all volunteering members of the ERPB. The group will ideally include at least representatives of payment service providers, consumers, retailers, and corporates. One representative of the ERPB Secretariat and a limited number of representatives of euro area NCBs will be invited to join the working group as active participants. The working group could also involve relevant third parties (e.g. mobile network operators, payment processors) as active participants. A representative of the EU Commission will be invited as observer. The working group is to be co-chaired by the EPC (supply side) and Eurocommerce / ERRT (demand side). The final composition of the working group will be submitted to the ERPB for endorsement.

[8] "For the execution of its mandate, the ERPB may establish a working group (...) for a limited period of time for dealing with specific work priorities. Several groups may operate in parallel, depending on the work priorities. A group is disbanded as soon as its mandate is fulfilled. (…) Depending on the work priority at hand, the group(s) may be asked by the ERPB to draft or make recommendations on business practices, business requirements for standards, standards or implementation specifications or to address specific issues" http://www.ecb.europa.eu/paym/retpaym/shared/pdf/ERPB_mandate.pdf ECB-RESTRICTED

Rules of procedure: The mandate of the ERPB defines a broad set of rules for the procedures of its working groups. The working group takes positions on a ¾ majority basis. Upon request, dissenting members (if any) may have their opinions annexed to the final document(s) prepared by the working group. The members of the group decide on how to organise their work. Costs related to the operation of the working group are met by the members of the group.

Annex 2: Composition of the ERPB Working Group on mobile and card based contactless proximity payments

Name	Surname	Nominating Institution
Co-Chairs		
Frederic	Mazurier	Eurocommerce
Dag-Inge	Flatraaker	EPC
Members		
Robert	Renskers	ESBG
José Carlos	Bringas Casado	EPC
Paul	Alfing	Ecommerce Europe
Pascal	Spittler	EuroCommerce
Charlie *Alternate:* Ben	Craven Smith	EPIF
Patrice	Hertzog	EACB
Faiza	Mahmood	EMA
Michael *Alternate* Patrick	Hoffmann Poncelet	EBF
Farid	Aliyev	BEUC
Massimo	Battistella	EACT
Carlos *Alternate:* Michael	Soares Taggart	Public Administrations
Anne-Sophie	Parent	AGE Platform
NCBs		
Judith	Looman	DNB
Johannes *Alternate:* Julien	Klocke Novotny	Bundesbank
Sergio A*lternate:* Esther	Gorjón Barruetabeña	BdE
Christiane *Alternate:* Alexander	Dorfmeister Mayrhofer	OeNB
Li-Chun	Yuan	BcL
ECB		
Francesco *Alternate:* Iddo	Di Salvo De Jong	ECB
Observer		
Barry *Alternate:* Pierre-Yves	Harrington Esclapez	European Commission
Guests		

Richard *Alternate:* David	Koch Stephenson	ECPA
David *Alternate:* Chris	Dechamps Kangas	MasterCard
Marc *Alternate:* Agnes	Temmerman Revel	Visa
Priya	Vempati	American Express
Christian *Alternate:* André	Schollmeyer Nash	Girocard
External Liaison		
Dave	Wilson	EMVCo
Margot *Alternate:* Xavier	Dor Piednoir	ETSI
Yves *Alternate:* Gil	Moulart Bernabeu	GlobalPlatform
Claire *Alternate:* Harald	Maslen Boerekamp	GSMA
Arnaud *Alternate:* William	Crouzet Vanobberghen	Nexo
Secretariat		
Marijke	De Soete	EPC

Table 13: ERPB WG participants

Annex 3: Template of the survey on mobile and card based contactless proximity payments

1. INTRODUCTION

This survey is being developed in preparation of a landscaping overview on Mobile and Card Based Contactless Proximity Payments.

The aim of this survey is to provide input on the following topics:

A. Existing or planned mobile and card based contactless proximity payment solutions;
B. Existing or planned white papers and technical and security specifications / standards related to mobile and card based contactless proximity payments;
C. Existing or planned regulations and recommendations / guidelines on mobile and card based contactless proximity payments, including security and privacy aspects;
D. Issues or barriers that may prevent the development of pan-European solutions.

The reader is referred to Annex I for a list of abbreviations used in this document.

Submitters are encouraged to provide as much information and as detailed as possible. If needed, section A can be copied as needed should multiple mobile and card based contactless proximity payment solutions be available and/or planned in one single country.

Submitters are kindly requested to return the completed survey to the Working Group Secretariat by **13 February 2015.**

2. SURVEY

Country:		**Name Submitter:**	
Organisation:			

A. Mobile and Card Based Contactless Proximity Payment Solutions

What Mobile or Card Based Contactless Proximity Payment solutions are currently being offered in your country or are scheduled to be offered in the near future?

Name of solution:	
Mobile or Card based:	
Short description of solution:	
Launch date and Operational status:	
Geographic coverage:	Within countries:
	Cross-border:
Currency:	
Volumes (last month for which data is available):	Number of customers:
	Total number of transactions:
	Overall total of transaction amounts:
Partners involved (e.g., PSPs, MNOs, TSMs, …):	
Technical solution used (e.g., MCP application on card, MCP application on SE on mobile device, Remote MCP application accessed via	

mobile device, etc…):	
Infrastructure(s) used (e.g. bank infrastructure, clearing and settlement systems, card infrastructure, ...):	
Source account (e.g. payment account, prepaid card, ...)	
Standards / Guidelines used for system components and communication protocols:	
Evaluation / certification/ type approval used for system components (card, SE, mobile device, POI, etc…) and communication protocols	
Payment instrument(s) used:	
Consumer / Merchant identification and authentication methods:	
Additional remarks:	

B. Overview White Papers, Specifications and Standards for Mobile and Card Based Contactless Proximity Payments

Annex II provides a list of white papers, technical and security specifications / standards or Mobile and Card Based Contactless Proximity Payments. Please identify any missing document(s) that should be taken into account for this landscaping exercise as appropriate.	
Missing document(s):	

C. Overview Regulations and Recommendations / Guidelines on Mobile and Card Based Contactless Proximity Payments including security and privacy aspects

Annex III provides a list of regulations and recommendations / guidelines for Mobile and Card Based Contactless Proximity Payments, including security and privacy aspects. Please identify any missing document(s) that should be taken into account for this landscaping exercise as appropriate.	
Missing document(s):	

D. Issues/Barriers

What do you consider to be the most important issues and barriers for the development of pan-European mobile based contactless proximity solutions?

Issue/Barrier 1:	
Possible Solution for Issue/Barrier 1:	
Issue/Barrier 2:	
Possible Solution for Issue/Barrier 2:	
……	

What do you consider to be the most important issues and barriers for the development of pan-European card based contactless proximity solutions?

Issue/Barrier 1:	
Possible Solution for Issue/Barrier 1:	
Issue/Barrier 2:	

Possible Solution for Issue/Barrier 2:	
…….	

Annex 4: Outcome on barriers identified through the survey

Annex 4.1 Common barriers

This section lists the common barriers/gaps/issues identified through the survey which are applicable both to card and mobile based contactless proximity payments.

#	Description of barrier/gap/issue	% coverage in survey[9]	Competitive / Cooperative space
B1	Lack of one common (open) standard for contactless transactions both for card and mobile NFC contactless transactions • Card NFC and Mobile device NFC differences in technical specifications with regards to hardware, chip operating system, NFC application, NFC radio transmission and data encryption protocols between card-NFC and mobile device-NFC – lack of standardisation of mobile contactless payments • Usage of closed proprietary technical standards • Multiplicity of standards for NFC contactless payments • Interoperability of contactless acceptance infrastructure • Uniform payment experience • Lack of common protocol on the acquiring side • Local solutions (carrying international brands) which do not work cross-border • Testing and certification	50	COOP
B2	Lack of ubiquity of contactless POI terminals (no sufficient coverage, slow deployment speed, no customer habituation) • Lack of widespread merchant acceptance • A lack of ubiquity in any given market or region may hinder consumer habituation towards contactless technologies and propositions	48,9	COOP/COMP
B3	Business model sustainability • Few parties dominating the market resulting in a lack of competition and in consumer dependence • Freedom of choice for consumer and merchant (standard payment method should not be prescribed by the scheme)	8,3	COMP
B4	Clashes when several NFC cards/devices are presented at once, leading to conflicts with acceptance problems	6,3	COOP
B5	Bad user interface of contactless POI (uniform way of	16,6	COOP/COMP

[9] The percentage reflects the number of respondents that have identified this barrier through the survey

	making a payment, display, keys, contactless spot and symbol, clear audio feedback when proximity transaction was accepted/rejected …) Bad ergonomics Accessibility features		
B6	Acceptance problems (e.g. PIN on line not supported, TAP + mobile code+ TAP not supported, etc…) Difference between online and offline transactions, creating cross-border interoperability problems and bad consumer experience (and missed opportunities for merchants and PSPs)	6,3	COOP/COMP
B7	Differences in transaction amount limits per sector (retail, parking, toll ways) + cross border	4,2	COOP
B8	The new card IF Regulation (requiring application selection for co-branded cards), which introduces additional steps into the payment process and impacts the transaction speed	2,1	COOP
B9	Lack of business case • Decreasing card industry profitability (e.g; IF regulation negatively impacts business case to innovate and to invest) • Difficulties for the set-up of transaction fees in view of low transaction amounts • POI hardware replacement and costs • Costs for issuers • Costs for merchants • Cost of integration of mobile payments • Cost of UICC centric SE • Lack of business case for an SE based NFC solution • Economic barriers: financial institutions (as well as other players, such as merchants) face the high cost of technological infrastructures /developments and equipment renewals • Life time of new technology products and renewal / migration cycles for payment products	31,3	COMP
B10	Protection against fraud, security and privacy issues • Implement contactless with consumer verification method if above floor limit • Wireless skimming • Data protection concerns by consumers and authorities • All parties involved in the payment scheme must ensure the same level of security	31,3	COOP
B11	Lack of consumer/customer acceptance / demand • Lack of trust by the consumers in this form of payments - new technology (what if I lose my card/mobile device) • Reliability • Complexity of products	51	COOP

	• Consumer advantages (e.g. combination with VAS) not visible enough • Lack of consumer proximity habits (e.g. scanning 2D barcodes, waving card or mobile device) • Lack of agnosticism in methods to carry out mobile payments • Easiness of solution for consumer (re-use consumer habits / handling) / consumer convenience/uniform consumer experience • Lack of ubiquity in consumer education & communication with respect to security, speed, reliability, consistency on mobile proximity payments • Lack of equally advanced consumer education/awareness		
B12	Lack of ubiquity of merchant training Lack of equally advanced merchant education/awareness	8,3	COOP
B13	Consumer affordability (card services related costs)	2,1	COMP
B14	Lack of interoperability of existing acceptance infrastructure (accepting NFC and 2D barcodes and…)	2,1	COOP

Table 14: Barriers for card and mobile proximity payments

Annex 4.2 Additional barrier for contactless card payments

This section lists the additional barriers/gaps/issues identified through the survey which are specific to contactless card payments.

#	Description of barrier/gap/issue	% coverage in survey[10]	Competitive / Cooperative space
CB1	No consumer need for contactless cards	2,1	COOP

Table 15: Additional barrier for contactless card payments

Annex 4.3 Additional barriers for mobile proximity payments

This section lists the additional barriers/gaps/issues identified through the survey which are specific to mobile contactless proximity payments.

#	Description of barrier/gap/issue	% coverage in survey[11]	Competitive / Cooperative space
MB1	Complexity of mobile ecosystem • Very large variety of models with different actors and different business impacts	28,6	COMP

[10] The percentage reflects the number of respondents that have identified this barrier through the survey
[11] The percentage reflects the number of respondents that have identified this barrier through the survey

	• Collaboration requires a lot of resources • Predominance of vertical business models: many of the existing solutions are vertical portfolios. • It is difficult to reach an agreement on a common unique solution given that there are many different third parties. • Complexity of ecosystem for issuing payment applications in a smartphone - each player aims to control the customer experience and ensure ROI • Establishment of partnerships between PSPs and MNOs / TSMs; • From a PSP perspective: dependency on the MNOs		
MB2	Lack of ubiquity (no sufficient coverage) of NFC enabled mobile devices Availability of mobile phones with Android Kit Kat 4.4 and higher	18,8	COOP/COMP
MB3	Lack of incentives for stakeholders in the mobile ecosystem • Lack of incentives for acquirers • Lack of interaction with public infrastructures • Lack of involvement of public sector • Consumer advantages (combination with VAS) not visible enough • The absence of incentives for telecom operators to develop NFC solutions	10,4	COOP/COMP
MB4	Mobile competitive landscape • Co-existence of different payment solutions of multiple PSPs on mobile device • Gaining consumer attention is increasingly difficult • New proprietary payment methods (Apple, Google,….) will change the payment landscape leading to a complexity of payment options and increase of acceptance and back-end costs • Owner of wallet solutions may prevent competition amongst payment products in their wallet • Co-existence on mobile device with other mobile services /applications (with different lifecycle)	10,4	COMP/COOP
MB5	Fragmented and immature mobile technology landscape and immaturity of mobile payments solutions • Technology options on the consumer side (issuance) make it challenging for issuers to develop strategies/road maps with a viable business case and market reach. • Uncertainty for developers associated to the future prevalent technology	37,5	COOP

	• Payment infrastructures on which mobile solutions are built are strongly different country by country. • Many closed loop /proprietary solutions with no pan-European acceptance involving different technologies and infrastructures resulting in interoperability issues -barrier for market integration –customer confusion • Differentiation of technologies used and no stable establishment of the most widely accepted technologies (SE or HCE based, NFC, 2D barcodes or SMS) • Technical complexity • Poor implementation guidelines and specifications with a lot of room for different choices make it a labour intensive and high barrier for smaller banks with little expertise and resources to start a project.		
MB6	Complexity and security of mobile devices • Complexity of user interfaces • Change of behavior due to software updates • Solutions in the market are multiple, different and not compatible with all mobile devices. This may create confusion among users. • Firmware of mobile phones – lack of uniform solution for all types of mobile devices • Insufficient security features for smart phones and missing security standards for mobile payments • Stability and security of mobile devices as a platform • The security of secure elements of mobile phones is still an unknown • Rooting (jailbreaking) of mobile phones • Increased malware in mobile devices	18,8	COOP
MB7	Specific standardisation needs for mobile payments • Time at check-out should be at least as fast as with a card payment • Lack of standardisation in the payment initiation message (e.g. 2D barcodes) • Lack of standards for the enrolling in digital wallets. • The absence of standard procedures to personalise card data into secure elements. • Multiple methods (no PIN, PIN at POI, mobile code, fingerprint,…) leading to non-interoperable solutions and consumer confusion • Co-existence of multiple MCP applications on # SEs, cloud, HCE	10,4	COOP

MB8	Fragmentation: no central repository based on common European standard (IBAN, mobile number, ...)	2,1	COOP
MB9	Lack of pan-European infrastructure for instant payments	4,2	COOP
MB10	Increased risk compared to physical card based transactions • Increasing consumer convenience for mobile payments also increase risk due to less strong authentication compared to card present EMV transactions	2,1	COOP
MB11	Availability of mobile payments on accessible phones – Accessibility of mobile payment solutions	10,4	COOP
MB12	Unnecessary or inappropriate regulatory interference in the emerging and developing market the unintended consequences of which may stifle innovation and prevent participants bringing consumer focused services to the market Excessive regulation impacts more heavily smaller/new players	6,3	
MB13	A common regulatory and legal framework in mobile-based, contactless proximity solutions is a necessary prerequisite for the development of a pan-European product offer.	2,1	

Table 16: Additional barriers for mobile proximity payments

Annex 5: Legal and regulatory documents impacting mobile and card-based contactless proximity payments in Europe

Reference	Document	Title	Issued by:
[EU1]	Dir. 95/46/EC	Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data.	EU
[EU2]	Dir. 2005/60/EC	Directive 2005/60/EC of the European Parliament and of the Council of 26 October 2005 on anti-money laundering and terrorist financing.	EU
[EU3]	Dir 2007/64/EC	Directive 2007/64/EC of the European Parliament and of the Council of 13 November 2007 on payment services in the internal market.	EU
[EU4]	Dir. 2009/110/EC	Directive 2009/110/EC of the European Parliament and of the Council of 16 September 2009 on the taking up, pursuit and prudential supervision of the business of electronic money institutions amending Directives 2005/60/EC and 2006/48/EC and repealing Directive 2000/46/EC.	EU
[EU5]		Draft Directive of the European Parliament and of the Council on the prevention of the use of the financial system for the purpose of money laundering and terrorist financing (first draft issued 5 February 2013).	EU
[EU6]]	Draft PSD2	Draft Directive of the European Parliament and of the Council on payments services in the internal market and amending Directives 2002/65/EC, 2013/36/EU and 2009/110/EC and repealing Directive 2007/64/EC.	EU
[EU7]	Draft NIS Directive	Draft Directive of the European Parliament and of the Council concerning measures to ensure a high common level of network and information security across the Union (draft issued 07 Feb. 2013).	EU
[EU8]	Reg. 1781/2006	Regulation (EC) No 1781/2006 of the European Parliament and of the Council of 15 November 2006 on information on the payer accompanying transfers of funds.	EU
[EU9]	Reg. 924/2009	Regulation (EC) No 924/2009 of the European Parliament and of the Council of 16 September 2009 on cross-border payments in the Community and repealing Regulation (EC) No 2560/2001.	EU
[EU10]	Reg. 260/2012	Regulation (EC) No 260/2012 of the European Parliament and of the Council of 14 March 2012 establishing technical and business requirements for credit transfers and direct debits in euro and amending Regulation (EC) No 924/2009.	EU
[EU11]	Reg. 2015/751	Regulation (EU) 2015/751 of the European Parliament and of the Council of 29 April 2015 on	EU

		interchange fees for card-based payment transactions.	
[EU12]		Draft Regulation the European Parliament and of the Council on the protection of individuals with regard to the processing of personal data and on the free movement of such data (first draft issued 25 Jan. 2012).	EU
[EU13]		Draft Regulation the European Parliament and of the Council on information accompanying transfers of funds (first draft issued 5 February 2013).	EU
[EU14]	COM(11) 941 final	Green Paper "Towards an integrated European market for card, internet and mobile payments".	EU
[ECB1]	[ECB1]	Draft SecuRe Pay Recommendations for the Security of Mobile Payments.	ECB/ Eurosystem
[EN1]	EN 16570	Information technology - Notification of RFID - The information sign and additional information to be provided by operators of RFID application systems	CEN
[EN2]	EN 16571	Information technology - RFID privacy impact assessment process	CEN
[EN3]	EN 301549	Accessibility requirements suitable for public procurement of ICT products and services in Europe	CEN / CENELEC / ETSI
[FCA1]	TR14/15	Thematic Review 14/15 Mobile Banking and Payments.	Financial Conduct Authority UK

Table 17: Legal and regulatory documents

Annex 6: Technical and security reference documents related to mobile and card-based contactless proximity payments

This annex lists the inputs received through the survey and the ERPB WG participants on various documents related to contactless and mobile proximity payments from different standardisation and industry bodies. These documents range from white papers, over specifications, guidelines, to test documents.

The table below depicts on which topics the respective standardisation and industry bodies are mostly active with respect to the mobile payment architecture.

A	The secure element that hosts the contactless payment application and other application(s)	EMVCo, ETSI SCP, GlobalPlatform, GSMA
B	The contactless module, which implements the digital portion of the EMV contactless interface and is responsible for the routing of contactless information	EMVCo, ETSI SCP, NFC Forum
C	The component (antenna) that implements the analogue part of the EMV contactless interface	EMVCo, NFC Forum
D	The baseband and application processors and other components (excluding the secure element, contactless module, and antenna) that form the mobile device	EMVCo, ETSI SCP, GSMA, GlobalPlatform
E	The contactless payment application(s)	Payment System(s)
F	The payment terminal	EMVCo, Payment Systems , PCI-SSC
G	The provisioning and personalisation system	EMVCo, GSMA, Payment Systems , GlobalPlatform
H	The application update system	EMVCo, Payment Systems

Table 18: Mobile Payment Architectural Zones (courtesy EMVCo)

Reference	Document	Title	Issued by:
[AXP1]		Expresspay Communication Layer	American Express
[AXP2]		Expresspay Card Specification	American Express
[AXP3]		Expresspay Terminal Specification	American Express
[AXP4]		AXP Contactless NFC Terminal Implementation Guide	American Express
[AXP5]		Expresspay Issuer Mobile Implementation Guide	American Express
[AXP6]		Contactless Brand Guidelines – English	American Express
[AXP7]		Expresspay Mobile HCE Specifications	American Express
[AXP8]		Mobile InforGraphic	American Express
[CH1]		HCE and SIM Secure Element – It's not black and white	Consult Hyperion
[CTAP]		C-TAP specifications for the terminal to acquirer interface	Acquiris
[DNF1]		Guideline for user-friendly payment terminals	Dutch National Forum on the Payment System
[EAN1]		Towards a better payment experience	Eye Association Netherlands
[EBA1]		Opinion Paper on Next Generation Alternative Retail Payments: User Requirements	European Banking Association
[EBU1]		Access to card, internet, and mobile payments for people with sight loss	European Blind Union
[EMV1]		EMV Integrated Circuit Card Specifications for Payment Systems	EMVCo
[EMV2]		EMV Contactless Specifications for Payment Systems, Book A: Architecture & General Remarks	EMVCo
[EMV3]		EMV Contactless Specifications for Payment Systems, Book B: Entry Point	EMVCo
[EMV4]		EMV Contactless Specifications for Payment Systems, Books C1 – C7: Kernel Specifications	EMVCo
[EMV5]		EMV Contactless Specifications for Payment Systems, Books D: Contactless Communication Protocol	EMVCo
[EMV6]		EMVCo Contactless Mobile Payment Architecture Overview	EMVCo
[EMV7]		EMVCo Handset Requirements for Contactless Mobile Payment	EMVCo
[EMV8]		EMV Contactless Mobile Payment - Application Activation User Interface	EMVCo

[EMV9]		EMVCo Mobile Contactless - EMV Profiles of GlobalPlatform UICC Configuration	EMVCo
[EMV10]		EMV Payment Tokenisation Specification – Technical Framework	EMVCo
[EMV11]		EMVCo Card and Mobile Testing Framework for Contactless	EMVCo
[EMV12]		EMVCo White Paper on Mobile Security Use Cases and Best Practices	EMVCo
[EMV13]		EMVCo White Paper on Contactless Mobile Payments	EMVCo
[EMV14]		EMVCo Handset Requirements for Contactless Mobile Payment	EMVCo
[EMV15]	SB 94	Aligns the Kernel Identifier Tag and corrects the Contactless Protocol Parameter Profile Values and the Class byte for the PUT TEMPLATE, GET TEMPLATE and SET MODE commands	EMVCo
[EMV16]	SB 119	Clarifies Group Member CREL and FCI contactless characteristic declarations, clarifies behavior related to Length of Base AID and corrects the content of the returned PPSE version	EMVCo
[EMV17]	SB129	Clarifies the Use of Internal Mode for PPSE with GlobalPlatform-based Secure Elements	EMVCo
[EMV18]	SB142	User Interaction Parameters for Installation of Contactless Mobile Payment Applications	EMVCo
[EMV19]	SB150	Support of extended logical channels	EMVCo
[EMV20]	Mobile Type Approval Bulletin nº5	UICC–Test Kit Availability To Product Providers	EMVCo
[EMV21]	Mobile Type Approval Bulletin nº7	Mobile Level 1 Test Applet Requirements	EMVCo
[EMV22]	Mobile Type Approval Bulletin nº9	Contactless Level 1 November Release Version 2.4a	EMVCo
[EMV23]	Mobile Type Approval Bulletin nº10	Mobile Product - EMV Contactless Level 1 Test Assessment	EMVCo
[EMV24]	Mobile Type Approval Bulletin nº11	Mobile Product – CMP PPSE Applet Type Approval Process	EMVCo
[EMV25]	Mobile Type Approval Bulletin nº12	Mobile Level 1 Testing - Operating Volume	EMVCo
[EMV26]	Mobile Type Approval Bulletin nº13	Testing availability for products supporting EMV Contactless Communication Protocol Specification v2.5	EMVCo
[EMV27]		EMV Next Generation Kernel System Architecture Overview	EMVCo

[EPAS1]	EPAS Retailer Protocol	EPAS Sale to POI Protocol Specifications	ePAS
[EPAS2]	EPAS TSM Protocol	EPAS TMS Protocol Message Usage Guide	ePAS
[EPAS3]	EPAS Acquirer Protocol	EPAS Acquirer Protocol Message Usage Guide	ePAS
[EPAS4]	EPAS Protocols Security	EPAS Card Payment Protocols Security	ePAS
[EPC1]	EPC 020-08	SEPA Cards Standardisation "Volume" Book of Requirements Book 1: General Book 2: Functional Requirements Book 3: Data Elements Book 4: Security Book 5: Conformance Verification Procedures Book 6: Implementation Guidelines	EPC / CSG
[EPC2]	EPC 220-08	Mobile Contactless Payments Service Management Roles - Requirements and Specifications	EPC / GSMA
[EPC3]	EPC 492-09	White Paper Mobile Payments	EPC
[EPC4]	EPC 178-10	Mobile Contactless SEPA Card Payments Interoperability Implementation Guidelines	EPC
[EPC5]	EPC 163-13	White Paper Mobile Wallet Payments	EPC
[ETSI1]	ETSI TS 102 588	Technical Specification Smart Cards; Application invocation API by a UICC Web Server for Java Card Platform	ETSI
[ETSI2]	ETSI TS 102 622	Smart Cards; UICC – Contactless Front-end (CLF) interface; Host Controller Interface (HCI)	ETSI
[ETSI3]	ETSI TS 102 613	Smart Cards; UICC-CLF Interface; Physical and Data Link Layer Characteristics	ETSI
[ETSI4]	ETSI TS 102 705	Smart Cards; UICC Application Programming Interface for Java card for Contactless Applications	ETSI
[GIRO1]		Ergonomie-Studie zum kontaktlosen Bezahlen	Girocard / Fraunhofer
[GP1]	GPC_SPE_034	Card Specification	GlobalPlatform
[GP2]	GPC_SPE_007	Card Specification Amendment A: Confidential Card Content Management	GlobalPlatform
[GP3]	GPC_SPE_025	Card Specification - Amendment C: Contactless Services	GlobalPlatform
[GP4]	GPC_SPE_042	Card Specification - Amendment D: Card Secure Channel Protocol “03”	GlobalPlatform
[GP5]	GPC_SPE_092	Card Specification - Amendment E: Security upgrade for card content management	GlobalPlatform
[GP6]	GPC_SPE_093	Card Specification - Amendment F: Card	GlobalPlatform

		Secure Channel Protocol “11”	
[GP7]	GPS_SPE_002	GP Messaging configuration for management of mobile-NFC Services	GlobalPlatform
[GP8]	GPC_GUI_010	UICC Configuration	GlobalPlatform
[GP9]		GlobalPlatform’s Proposition for NFC Mobile: Secure Element Management and Messaging (White Paper)	GlobalPlatform
[GP10]	GPC_SPE_031	Composition Model	GlobalPlatform
[GP11]	GP_REQ_004	Requirements for NFC Mobile: Management of Multiple Secure Elements	GlobalPlatform
[GP12]	GPD_SPE_009	TEE System Architecture	GlobalPlatform
[GP13]		A secure solution for deploying value-added mobile services	GlobalPlatform
[GP14]		White paper: Leveraging GlobalPlatform to improve security and privacy in the Internet-of-Things	GlobalPlatform
[GSMA1]	Pay-Buy-Mobile Initiative	Requirements for Single Wire Protocol NFC Handsets	GSMA
[GSMA2]		NFC Technical Guidelines White Paper	GSMA
[GSMA3]	Pay-Buy-Mobile Initiative	Pay-Buy-Mobile Business Opportunity Analysis White Paper	GSMA
[GSMA4]		NFC UICC Requirements Specification	GSMA
[GSMA5]		NFC Handset APIs & Requirements	GSMA
[GSMA6]		White Paper: The Mobile Wallet	GSMA
[GSMA7]		NFC Core Wallet Requirements	GSMA
[GSMA8]		The New Mobile Payments Landscape	GSMA
[GSMA9]	TS.26	NFC Handset Requirements	GSMA
[GSMA10]	TS.27	NFC Handset Test Book	GSMA
[GSMA11]		Mobile Payment Security - Discussion paper	GSMA + UL
[GSMA12]		HCE and Tokenisation for Payment Services - Discussion paper	GSMA / Consult Hyperion
[ISO1]	ISO/IEC 7813	Information technology - Identification cards -Financial transaction cards	ISO
[ISO2]	ISO 8583-1	Financial transaction card originated messages - Interchange message specifications - Part 1: Messages, data elements and code values	ISO
[ISO3]	ISO 8583-2	Financial transaction card originated messages - Interchange message specifications - Part 2: Application and registration procedures for Institution Identification Codes (IIC)	ISO
[ISO4]	ISO 9564-1	Financial services - Personal Identification Number (PIN) management and security - Part 1: Basic principles and requirements for card-based systems	ISO

[ISO5]	ISO 9564-2	Financial services - Personal Identification Number (PIN) management and security - Part 2: Approved algorithms for PIN encipherment	ISO
[ISO6]	ISO/DIS 12812-1	Core banking - Mobile Financial Services - General Framework - Part 1: General Framework	ISO
[ISO7]	ISO/DIS 12812-2	Core banking - Mobile Financial Services - General Framework - Part 2: Security and Data Protection	ISO
[ISO8]	ISO/DIS 12812-3	Core banking - Mobile Financial Services - General Framework - Part 3: Financial Application Lifecycle Management	ISO
[ISO9]	ISO/DIS 12812-4	Core banking - Mobile Financial Services - General Framework - Part 4: Mobile Payments to Persons	ISO
[ISO10]	ISO/DIS 12812-5	Core banking - Mobile Financial Services - General Framework - Part 5: Mobile Payments to Businesses	ISO
[ISO11]	ISO/IEC 14443-1	Identification cards - Contactless integrated circuit(s) cards - Proximity cards – Part 1: Physical characteristics	ISO
[ISO12]	ISO/IEC 14443-2	Identification cards - Contactless integrated circuit(s) cards - Proximity cards - Part 2: Radio frequency power and signal interface	ISO
[ISO13]	ISO/IEC 14443-3	Identification cards - Contactless integrated circuit(s) cards - Proximity cards - Part 3: Initialisation and anti-collision	ISO
[ISO14]	ISO/IEC 14443-4	Identification cards - Contactless integrated circuit(s) cards - Proximity cards - Part 4: Transmission protocol	ISO
[ISO15]	ISO/IEC 15408-1	Information technology - Security Techniques - Evaluation criteria for IT security - Part 1: Introduction and general model	ISO
[ISO16]	ISO/IEC 15408-2	Information technology - Security Techniques – Evaluation criteria for IT security - Part 2: Security functional components	ISO
[ISO17]	ISO/IEC 15408-3	Information technology - Security Techniques – Evaluation criteria for IT security - Part 3: Security assessment components	ISO
[ISO18]	ISO/IEC 18004	Information technology -- Automatic identification and data capture techniques -- QR Code 2005 bar code symbology specification	ISO
[ISO19]	ISO/IEC 18092	Information technology — Telecommunications and information exchange between systems — Near Field Communication — Interface and Protocol (NFCIP-1)	ISO
[ISO20]	ISO 20022-1	Financial Services – universal financial	ISO

		industry message scheme – Part 1: Metamodel	
[ISO21]	ISO 22022-2	Financial Services – universal financial industry message scheme – Part 2: UML Profile	ISO
[ISO22]	ISO 22022-3	Financial Services – universal financial industry message scheme – Part 3: Modelling	ISO
[ISO23]	ISO 22022-4	Financial Services – universal financial industry message scheme – Part 4: XML schema generation	ISO
[ISO24]	ISO 22022-5	Financial Services – universal financial industry message scheme – Part 5: Reverse engineering	ISO
[ISO25]	ISO 22022-6	Financial Services – universal financial industry message scheme – Part 6: Message transport characteristics	ISO
[ISO26]	ISO 22022-7	Financial Services – universal financial industry message scheme – Part 7: Registration	ISO
[ISO27]	ISO 22022-8	Financial Services – universal financial industry message scheme – Part 8: ASN.1 generation	ISO
[ITU-T1]	ITU-T Y.2741	Recommendation ITU-T Y.2741: Architecture of secure mobile financial transactions in next generation networks	ITU-T
[MC1]		M/Chip Mobile Specification	MasterCard
[MC2]		MasterCard Cloud-Based Payments 1. MasterCard Cloud-Based Payments-Product Description 2. MasterCard Cloud-Based Payments-Mobile Payment Application-Functional Description 3. MasterCard Cloud-Based Payments-Credentials Management System-Functional Description 4. MasterCard Cloud-Based Payments-Transaction Management System-Functional Description	MasterCard
[MC3]		MasterCard Contactless Reader Specification	MasterCard
[MC4]		M/Chip Advance Card Specification	MasterCard
[MC5]		PayPass-M/Chip 4 Card Application Specification	MasterCard
[MC6]		M/Chip Requirements for Contact and Contactless	MasterCard
[MC7]		Contactless Personalisation Data Specifications	MasterCard
[MC8]		M/Chip Advance Personalisation Data Specifications	MasterCard
[MC9]		M/Chip Card Personalisation Standard Profiles	MasterCard

[MC10]		MasterCard Contactless Kernel Configuration	MasterCard
[MF1]		White Paper - Alternatives for Banks to offer Secure Mobile Payments	MobeyForum
[MF2]		White Paper - Business models for NFC payments	MobeyForum
[MF3]		Mobile wallet Part 1 - Definitions and Visions Part 2 - Control Points in the Mobile Wallet Part 3 - The Hidden Controls Part 4 - Structure and Approaches Part 5 – Strategic Options for Banks	MobeyForum
[MF4]		The Host Card Emulation in Payments – Options for Financial Institutions	MobeyForum
[MF5]		NFC Mobile Payments - An Industry Snapshot	MobeyForum
[MF6]		A Series of White Papers on NFC Security Part 1: A Security Analysis of NFC Implementation in the Mobile Proximity Payments Environment	MobeyForum
[OSC1]		OSCar Functional scope	OSCar
[OSC2]		OSCar POS integration specification for SEPA compliant terminals	OSCar
[OSC3]		OSCar test and certification policy_v1.0	OSCar
[PCI1]		Payment Card Industry Point of Interaction (POI) Modular Security Requirements	PCI
[PCI2]		Payment Card Industry PIN Security Requirements	PCI
[PCI3]	PCI DSS	Payment Card Industry Data Security Standard	PCI
[PCI4]	PCI PA-DSS	Payment Card Industry Payment Application Data Security Standard	PCI
[UKC1]		White Paper: Requirements to Achieve Scalable Rollout of Mobile Contactless Payments in the UK	The UK Cards Association / Consult Hyperion
[UKC2]		NFC Steering Board: POI Etiquette	The UK Cards Association
[UKC3]		Report: Mobile Contactless Payments Specification Summary	The UK Cards Association / Consult Hyperion
[VISA1]	VCPS	Visa Contactless Payment Specifications	Visa
[VISA2]		Visa Contactless Reader Implementation Notes	Visa
[VISA3]	VMCPS	Visa Mobile Contactless Specifications	Visa
[VISA4]		Visa Multi-Access Specification for VMPA	Visa
[VISA5]		Visa Cloud-based Payments Minimum Requirements and Guidelines	Visa
[VISA6]		Visa Cloud-based Payments Contactless Specifications	Visa

Table 19: Technical and security reference documents

Annex 7: Country profiles

Annex 7.1 Poland

The profile for Poland has been provided by PKO Bank Polski (click on the icon to open the document).

ERPB CTLP 74-15
Poland Market Contac

Annex 7.2 UK

The profile for the UK has been provided by the UK Cards Association (click on the icon to open the document).

ERPB CTLP 67-15 UK
Market Contactless Ac

Annex 8: Impact analysis of IF Regulation on contactless payments

This annex contains the impact analysis of the IF Regulation on contactless payments which has been conducted over the past months by a dedicated team of the Cards Stakeholders Group (click on the icon to open the document).

CSG 174-15 v0.4
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