AN INVESTIGATION OF DIGITAL PAYMENT PLATFORM DESIGNS: A COMPARATIVE STUDY OF FOUR EUROPEAN SOLUTIONS

Complete Research

Kazan, Erol, Copenhagen Business School, Howitzvej 60, 2000 Frederiksberg, Denmark, eka.itm@cbs.dk

Damsgaard, Jan, Copenhagen Business School, Howitzvej 60, 2000 Frederiksberg, Denmark, jd.itm@cbs.dk

Abstract

This paper focuses on the triumph march of mobile phones that currently are annexing music players, navigation devices, and cameras as separate physical objects. The next target is set on payment. Through synthesizing available literature, we construct a framework for studying digital payment platforms that combines platform, technology and business design aspects. The framework is applied to conduct a comparative case study of digital payment platforms. Four types of market actors are considered: banks, mobile network operators, merchants, and startups, which are incumbents and disrupters in the payment industry. These actors issue four types of payment systems, and we can observe that three of four platforms types can be classified as multi-sided platforms (MSP). All alternatives seek foothold by issuing evolutionary payment instruments, which are intertwined with digital payment platforms. By hosting third-party services, payment instruments are evolving from single-purpose to multi-functional ones. Our research extends existing payment literature from the MSP perspective to emphasize certain digital payment platform components, which impact strategies and complementary products.

Keywords: Payment, payment card, mobile phone, multi-sided platforms, Near Field Communication (NFC), contactless payment, SMS, QR Code, mobile payment, payment infrastructure, payment systems

1 Introduction

The mobile phone is a radical innovation and it demolishes well-established industries and business models, while gradually eroding their hard-earned concessions. As testimony, consider some examples: the mobile phone has or is in the midst of subsuming music players, navigation devices, and cameras as separate physical objects, with its corresponding industry and actors. The mobile phones´ triumphant march keeps propelling forward, and it is already on its way to conquering the next industry, namely payment. Currently, the payment arena is well established with predefined and well-rehearsed roles and profitable business models. However, we suspect that the mobile phone is going to upset the harmony and equilibrium that currently characterizes the payment industry.

New payment disrupters, most of them novices in the payment landscape (e.g. Google Wallet, Dwolla), are in attempt to change the status quo of payment. By issuing new digital payment instruments, payment disrupters have the deliberate goal to challenge payment incumbents. But before a new payment instrument can be adopted, market players such as banks, acquirers, payment solution providers, mobile network operators (MNO); as well as merchants and cardholders need to be convinced. That these market actors also follow their own payment agenda (e.g. MNOs) adds uncertainty, resulting in delayed adoption and a "cold war" of pre-emptive moves to secure a potential future market position.

As the mobile phone is gaining a foothold in the payment industry, how do payment disrupters, strategically design and manage their digital payment service, in order to be adopted on the payer and payee side? First, since payment is the process of transferring money from payer to payee that involves physical payment instruments (Kokkola, 2010), how do payment disrupters design (technology-wise) their physical payment instruments. Second, as these payment instruments are digital proxies of payment platforms, equipped with Application Program Interfaces (APIs), how is platform access and maintenance regulated? Lastly, considering that payment fees is becoming less profitable in the near future (European Commission, 2013), how do payment disrupters tap new revenue sources. Thus, our research question is:

How are payment incumbents and disrupters designing the next-generation payment platform, and what design and business strategies can they employ?

To answer the research questions, we re-conceptualize new digital payment instruments as multi-sided platforms (MSP). We then derive a framework for multi-sided digital payment platforms that encompasses four components affecting providers' choice of digital payment platform design strategies. After a comparative case study, our initial findings indicate that payment platforms probably will transform from two-sided (cardholder & merchant) into multi-sided (digital) payment platforms, where the interplay of *platform design*, *technology design*, and *business design* are decisive elements, to create positive network effects among platform users. As this paper has a platform centric and design approach, we chose to exclude end users from our analysis.

Contribution and Overview

The contribution of this paper is threefold: First, we have conceptualized a framework, which we believe to enrich existing payment literature with a multi-sided platform theory perspective. This research is distilled from existing literature, by embracing a granular view on digital payment platforms. Second, by crafting a framework, we provide a theoretical lens to understand *what* digital payment platforms are, highlighting them as layered platforms. And lastly, as these platforms come in different design configurations, we offer insights on *how* a payment provider can strategically design and maneuver through these different platform layers, to fulfill their role as a payment provider.

The paper proceeds in the following manner: To develop the framework, in the next section we characterize payment and review the payment literature. In Section 3 we present our research

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framework by synthesizing factors that have been identified as critical in the launch of multi-sided platforms. In Section 4 we present our research method. In Section 5 we analyze four different payment systems planned or launched by four different types of actors in the European market. We synthesize our findings in Section 6 and finally, in Section 7, we draw some conclusions, discuss our limitations, and propose promising areas for further research.

2 Payment as Multi-sided Platforms

Payment is defined as a process of transferring money from payer to payee that involves payment instruments, payment processing and payment settlement (Kokkola, 2010). For the purpose of this paper we define money as fiat money, issued by governments, that is by law enforced to be accepted as legal tender (Rollins, 2003). In the mobile payment context, mobile payment is a payment instrument based on mobile devices (e.g., tablet computers or mobile phones) that makes use of wireless and communication technologies (Dahlberg, Mallat, Ondrus, & Zmijewska, 2008). To illustrate a card or mobile payment at the merchants' checkout counter, Figure 1 visualizes different stages of payment processing and settlement among various payment actors.

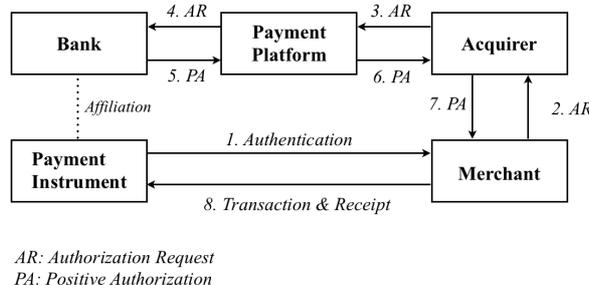AR: Authorization Request
PA: Positive Authorization

Figure 1: Payment Cycle

2.1 Payment Systems Research

Payment systems have not received extensive attention as a research topic over the past decade given the relative stability and well-defined roles that exist in the industry, but recently they have attracted growing attention. Scholars have studied payment systems and their corresponding payment cards as so-called two-sided platforms (or, in general, multi-sided markets) that need to attract both merchants and cardholders to be viable. Almost all papers point to network externalities (Rochet & Tirole, 2002); multi-homing costs, i.e., the burden of carrying several payment cards (Chakravorti & Roson, 2006); and acknowledging the importance of getting both sides on board – where one side is mostly subsidized while the other pays the revenue – to create a successful payment ecosystem (Evans & Schmalensee, 2005b). The earliest payment network literature by Baxter (1983) considered payment systems as four-party systems, consisting of cardholders and merchants with their corresponding financial institutions: the banks and the acquirers. Baxter did not explicitly examine payment systems as multi-sided platforms, but his analysis about interchange fees and showcasing the interdependencies among market actors lay the foundation for a series of research papers, beginning in 2002, that all consider payment systems to be two-sided markets.

Rochet & Tirole (2002, 2003a, 2003b, 2006) examined, in a series of research papers, payment cards as two-sided platforms or markets, where payment cards need to attract both merchants and cardholders to create membership and usage externalities. Wright (2004) describes two-sided platforms that are able to link two distinct types of groups, which obtain value from interacting with

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users from the other site on a common platform. Referring to payment cards schemes, he outlines that these platforms cater to cardholders and merchants, and that the conventional logic of one-sided markets is not a suitable approach to describe the payment card industry.

Chakravorti and Roson (2006) noted that cardholders and merchants have preferences for certain payment cards and brands, where multi-homing, i.e., carrying or accepting several payment cards, is a common phenomenon, which leads to payment network competition. Rysman (2009) considers payment cards as two-sided, whereas store cards and gas cards are inherently one-sided payment cards, due to the fact that they can only be used at the issuing company. Evans and Schmalensee (2005a) analyzed the pricing structures and antitrust issues of unitary or three-party payment systems (closed systems) such as AmEx, Diners Club and Discover Card, where card issuer and acquirer are the same, making interchange fees obsolete in this setting. On the other hand, multi-party payment systems or four-party payment schemes (open systems) such as Visa and MasterCard, allow third parties to join their payment networks, by fulfilling the requirements of card issuers or acquirers.

Evans, Hagiu, and Schmalensee (2006, p. 347) have briefly sketched a *"software platform-based ecosystem for payment cards"* as a multi-sided payment platform, discussing therein the historical failure of smart cards, which were able to host applications. However, Evans et al. (2006) did not sufficiently elaborate on how these new application payment platforms with their physical proxies are specifically designed to create network effects.

Overall, these papers do not attribute sufficient attention to recent technology design developments in the payment landscape, particularly, how payment instruments are transforming from a single-purpose (payment card) to a multi-functional ones (mobile phone). Digital payment platforms are becoming advanced IT systems, which can offer APIs to third parties. As a consequence, many digital payment platforms are evolving from being initially two-sided into multi-sided platforms. To illustrate the development, new payment service providers, e.g. Google Wallet, make use of Near Field Communication (NFC) and cloud computing technologies. In doing so, digital wallets can store several different cards at once (loyalty, credit and debit cards) in one device.

Considering the aforementioned aspects, current and prospective payment providers have to consider several strategic implications: First, the technology of payment instruments (e.g. NFC) has an impact on how payment works in practice. Second, as we perceive payment as digital platforms, which offer APIs, payment providers have to decide about platform design aspects, i.e. the degree of platform co-creation and the access by third parties. Third, as payment fees gradually diminish, payment providers have to explore new revenue generators or markets, as payment becomes a by-product.

To make sense of these new phenomena in the payment landscape, the following theoretical tool, "Digital Payment Platform Design," is conceptualized to assess and provide an understanding how payment disrupters design their digital payment platforms.

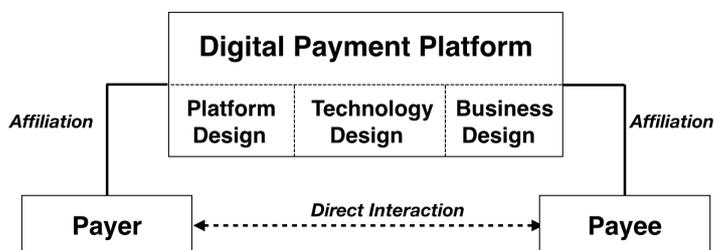# 3 Digital Payment Platform Design

In this section, we present our *Digital Payment Platform Design* framework, which is a synthesis of related works and existing literature we have identified as being essential to creating viable digital (mobile) payment platforms.

Traditionally, value creation has been achieved through a number of incremental steps from raw material to products and services (Porter, 1985; Stabell & Fjeldstad, 1998). This worked well for industrial products, but recently, ecosystems that create value by facilitating interactions among different groups have created an interest as an analytical lens for understanding value creation.

We adopt the notion by Hagiu and Wright (2011) and define a MSP as *"an organization that creates value primarily by enabling direct interactions between two (or more) distinct types of affiliated*

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customers." MSPs are either digital, such as search engines, or physical, like shopping malls that are attracting at least two distinct groups, both of which have the demand to interact with each other. Search engines, for instance, join searchers and advertisers; meanwhile, shopping malls are connecting shoppers and merchants (Hagiu & Wright, 2011). The platform itself thereby acts as an intermediary, which can be operated either by one or more entities, called "platform providers." The primary task of a platform is to coordinate and facilitate the direct interactions in a controlled manner, thereby providing the architecture and a set of rules for each participant. In general, the value of a MSP is highly dependent on the number of users on both sides (Eisenmann, Parker, & Van Alstyne, 2006). To describe the logic of new digital payment platforms, we adapted the framework by Hagiu and Wright (2011) that demonstrates the general idea of a MSP, which we have extended to represent a digital payment platform (Figure 2).

As this paper is focusing solely on digital payment platforms, in the remainder of this paper we therefore limit ourselves by excluding the merchant (payee) and the cardholder (payer), which are both subject to network effects, switching and homing costs (Kazan & Damsgaard, 2013), but will not be part of this analysis. We realize that a payment platform is *sine qua none* without the merchants and cardholder, however, we focus on the design aspects of the payment platform itself to provide a more in-depth analysis of this aspect.

Component	Description
Direct Interaction	Classifies a platform as being a Multi-Sided Platform.
Platform Design	Describes open and closed systems, and how complementary products are distributed.
Technology Design	The applied technology based on evolutionary or revolutionary hardware strategies.
Business Design	Market-entry strategies through bundling products and leveraging an installed user base (*envelopment attack)*. Alternatively, through Schumpeterian innovation, which is more radical, but rare to achieve.

Figure 2. Digital Payment Platform Design Framework

3.1 Direct Interaction

Direct interaction is the key criterion to classifying a platform as truly multi-sided. For instance, the music and movie store iTunes by Apple connects content providers with buyers. However, if we read the terms of use, it is actually a direct commercial purchase contract with Apple and not with the studios; therefore, iTunes is acting solely as a re-seller platform and not as a MSP. Contrary to the iTunes store, according to the terms of use, the Apple App Store is indeed a genuine MSP, which enables a direct commercial interaction between software developers and buyers. In consequence, to classify a (payment) platform as being multi-sided or not, the contract design that specifies the direct commercial relationships among third parties is an important aspect for the classification (Hagiu et al., 2011).

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3.2 Platform Design: Four different platform design strategies

To make sense of different platform strategies and how complementary products are distributed, we adapted the framework by Iyer and Henderson (2010) (Figure 3), which is a suitable theoretical lens to analyze the logic of different types of (payment) *platform design* strategies, determined by the level of platform co-creation (development dimension) and the distribution of complementary applications (usage dimension).

Development Dimension. MSPs can be characterized as being closed or open systems that determine the degree of involvement of third parties. Closed systems exclude third parties from any platform modification, where Apple serves as a good example. The iOS by Apple is a closed mobile operating system, allowing – with its walled garden approach – control over every aspect on the mobile device, thereby excluding any third parties from platform development. On the contrary, Google's Android mobile operating system is open source (i.e., the Android Open Source Project), allowing third parties significant modifications.

Usage Dimension. Platforms also differentiate as to how complementary applications are affiliated. Software developers for Windows, for instance, don't need the permission of Microsoft to build Windows software (free approach). Platforms accompanied by rules, where complementary software is affiliated in a controlled manner, represent the moderated approach. The app development for iOS requires Apple's permission to be affiliated and distributed through the platform.
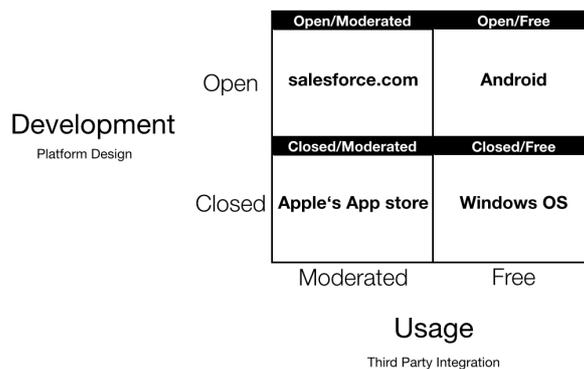

Figure 3. Development and Usage of IT Platforms

Through these two dimensions, we can derive four platform strategies:
1. The open and free approach allows third parties to alter and adapt the system to their needs, allowing them to distribute services without permission from the platform provider.
2. The closed and moderated approach is the opposite of the latter, representing a closed system with strict rules and to be an authorized application, the distribution of complementary products is centrally organized.
3. The open and moderated strategy is fusion of the aforementioned platform schemes, where third parties get involved in the system development process; however, the distribution of software is also centralized.
4. Lastly, the closed and free approach is applied by platform providers, which are allowing developers to build applications on top of their system, without seeking any authorization. However, access to, or modifications of, the core system are not permitted.

In the payment context, a payment provider that offers platform access to third parties has to consider platform design aspects to build a secure moat around its core service, and how to integrate third-party apps (usage), to avoid future risks, e.g., competing against your own user base – here, third-party applications.

3.3   Technology Design: Evolutionary & Revolutionary

Technological solutions based on hardware or software can be either categorized into evolutionary or revolutionary products (Shapiro & Varian, 1999).

Evolutionary products offer a migration path to a new technology, and at the same time, preserve backward compatibility to previous systems. These bridging technologies have the benefit of allowing access to an existing user base. As an example, Blu-Ray players are backward compatible, capable of playing old DVDs, which offers an additional path to a new technology, clearly illustrating an evolutionary hardware approach. Lastly, ***revolutionary*** products often offer better performance, however, representing a riskier approach. First, the technology itself is, in most cases, not compatible with the old and hence, not accessible by an existing user base. Second, it is uncertain whether the new technology takes off to create a critical user base, to create a viable platform. For instance, Long-playing Phonographs (LPs) are incompatible with CD players, requiring users to abandon their LP libraries. However, LP users were accepting these high switching costs, since CDs were more practical and affordable in their daily use (low homing costs). The incompatibility between LPs and CD players illustrates a revolutionary hardware approach. To exemplify technology design in the payment setting, smartphones equipped with NFC chips are revolutionary, since they offer a superior payment experience compared to the payment card. However, NFC smartphones are incompatible with current payment terminals (chip & PIN), reducing the accessibility on the merchant side und the utility on the payer side.

3.4   Business Design: Envelopment & Schumpeterian Innovation

Platform providers with the goal of entering into new markets to tap new revenue streams have two options: first, outpacing competitors through Schumpeterian innovation (Schumpeter, 1962, p. 83), i.e. being (creative) destructive and replacing the old, in most cases accomplished by firms coming from a different industry. Second, entering into new markets through platform envelopment, by leveraging shared user relationships and products.

Envelopment. Platform owners can be enveloped when prospective competitors enter into their market and offer the same functionality by bundling it with their existing products, and at the same time, have a high degree of user overlap. By offering a *multi-platform bundle* service, a platform attacker can conquer new business fields, and by that tapping new revenue streams (Eisenmann et al., 2006; Eisenmann, Parker, & Van Alstyne, 2011). As an example of a platform envelopment attack, Netscape was once the dominant Internet browser, but it has been enveloped through Microsoft's Internet Explorer web browser, since Netscape users were also users of Microsoft's Windows operating system. The target platform can strengthen its position, by bundling the platform with services that match with the attacker platform, or opening up to third parties to increase their value proposition (Eisenmann et al., 2011). ***Schumpeterian innovation*** presents a radical way to enter into a new market by *"destroying the old"* industry players, but this is costly or rarely achieved.

3.5   Framework Coherence

As we have showcased the abovementioned platform components, we can now draw the linkages, illustrating the explanatory power of our framework (Figure 4).
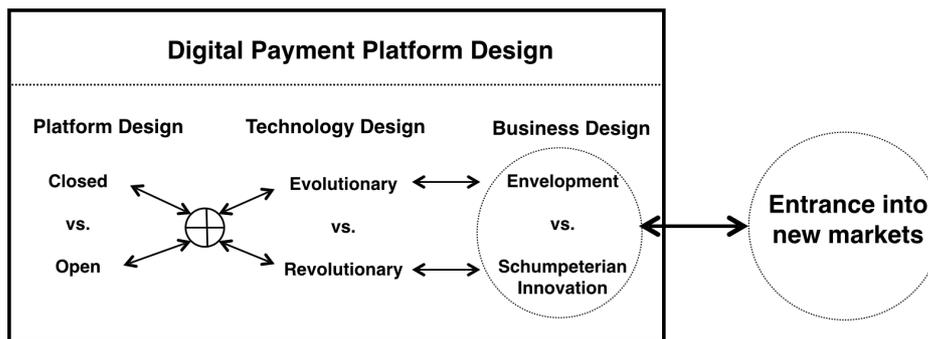
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Figure 4: Framework Coherence

To illustrate the *envelopment* strategy, platform providers that wish to enter the payment market (or any other industry with physical proxies) are required to leverage their existing user base, and at the same time, equip them with payment functionalities. Second, in order to have access to a new user base, these new payment instruments need to be compatible (*evolutionary*) with the existing payment infrastructure (e.g. payment terminals). Lastly, since these payment instruments (e.g. mobile phone) are proxies of digital platforms, platform design may differ, in being open or closed (*development dimension*), and in how the distribution of complementary applications is moderated (*usage dimension*). The presented model illustrates how these different platform components are intertwined and layered (i.e. platform & technology design), to explain business and technology design strategies of MSPs.

4   Research Method

Our study approach has an explorative nature, by synthesizing and consolidating key concepts and literature into a single theoretical framework. In order to provide an answer to the research questions, we perform within an European setting a comparative and interpretative case study (Walsham, 1995; Yin, 2009). Based on four cases, our digital payment framework serves as a theoretical lens to analyze and identify similarities and differences among the cases. The case study method has received ample attention in the IS community (Dubé & Paré, 2003), which has the advantage to answer "how" and "why" questions, where the researcher has limited or no control over the study object (Yin, 2009). Furthermore, by analyzing the idiosyncrasies of different payment incumbents and disrupters, a multiple case study promises to yield more general results, in order to grasp complex platform, technology and business structures (Yin, 2009).

Case Selection

We chose four types of market actors across Europe that exemplifies current digital payment providers: banks, MNOs, merchants and payment start-ups. Four European companies emerged from the data collection (girogo, Turkcell, Yapital & iZettle) due to large media coverage, and more importantly, being market leaders in their sector, having the potential leverage to establish new payment platforms on a larger scale.

Data Collection

We collected publicly available data from different online sources: press releases, online news and industry articles, interviews and speeches at conferences. The search was conducted through online industry and technology magazines, search engines and social media channels, while using certain keywords in the European payment context: *(NFC) mobile payment, NFC payment card, NFC MicroSD card, NFC SIM card, NFC phone payment, mobile phone payment, contactless payment, QR code payments,* and *payment card readers (dongles)* and limiting the time period from May 2011

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through the end of March 2013. Online industry and technology magazines were particularly useful, since they represent journalism, comprehensively covering recent technological developments in the retail and payment area with in-depth background knowledge and analysis. The sample size is presented in Table 1.

Data Sources	Description

Interviews	- Four interviews with Yapital's CEO Nils Winkler
	   • Two transcribed interviews by derhandel.de and etailment.de
	   • Two interviews in video format by empiria group (DE) and paperJam TV (LU)
	- One transcribed interview by mobilemoneyrevolution.co.uk with Turkcell's Cenk Bayrakdar, Chief New Technology Business Officer
	- One interview in video format by empiria group (DE) with Magnus Nilsson, iZettle's CFO

Press releases	All press releases related to new payment instruments: girogo (3), Turkcell (4), Yapital (4), iZettle (21)
Conference	One of the authors attended the payment conference "The Nordic and Baltic CAC Mobile & NFC Conference 2013," where iZettle provided insights during and after the presentation.
Online articles and reports	girogo (23), Turkcell (5), Yapital (7) and iZettle (9) (cisco.com, computersweden.se, derhandel.de, finextra.com, geldkarte.de, mobilepaymentstoday.com, nfctimes.com, nfcworld.com, spiegle.de, telecompaper.com, techcrunch.com, thenextweb.com, welt.de, WSJ.com)
Local radio news	Two radio news and radio interview about girogo (DAS HITRADIO and ddp direct)

Table 1. Data Sources for the Analysis

Analysis

The analyses were conducted in three stages: To begin, the first author imported the web data as PDF and audio files into Nvivo 10, a qualitative analysis software program that allows a structured way to collect and categorize data. Secondly, the first author performed a directed content analysis by coding and categorizing the unstructured data, based on the proposed framework (Hsieh & Shannon, 2005; Potter & Levine-Donnerstein, 1999). Thirdly, after the categorization, the first author had in-depth discussions with the co-author to interpret the data. Conversely, the second author plays the role of the devil's advocate by coming up with alternative interpretations and counter-arguments (Adler & Adler, 1988). The entire coding process followed an iterative cycle and data analysis was only completed when both authors agree on the placement of quotes in accordance with the proposed framework.

5. Four Digital Payment Platforms

To demonstrate the usefulness of our digital payment framework, we will analyze four types of digital payment platforms, provided by banks, MNOs, merchants and start-ups, each of which seek to sustain or overthrow the status quo in the payment area.

Sparkasse (Incumbent). In April 2012, the German saving bank group (Sparkasse) started the initiative to pilot test contactless payment cards, called girogo, in three major cities: Hannover, Braunschweig, and Wolfsburg. The pilot project has initially equipped 1.5 million cardholders with girogo NFC payment cards, enabling them to perform contactless payments. The existing debit card contains a built-in NFC prepaid card, where the NFC payment functionality is currently tied to the prepaid payment method. To incentivize the adoption of contactless payments on the merchant side, up to 20 Euro, girogo fees are lower (max. 3 Euro Cents) compared to the regular PIN payment method. Besides the pilot regions, the Sparkassen group has teamed up with a small number of soccer clubs, where member cards are bundled with girogo, allowing fast and convenient payments, fostering the brand perception beyond the pilot region. Other major German banks have not made the announcement that they will adopt the girogo, but are following the development closely. It is worth noting that all German banks are indirectly involved in girogo through the umbrella organization Deutsche Kreditwirtschaft that finances the R&D costs, offering the possibility to join the girogo bandwagon if and when it starts rolling.

Turkcell (Disrupter). In cooperation with the Turkish Yapi Kredit Bank and the credit card company MasterCard, Turkcell, the largest MNO in Turkey, launched in April 2011 its mobile payment

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initiative called Turkcell Cüzdan (Wallet). Turkcell's mobile payment service allows performing contactless mobile payment (Turkcell, 2011). So far, Turkcell has been successful in teaming up with several Turkish banks, which support Turkcell's NFC and mobile payment initiative. Turkcell's business model is based on a SIM rental model, charging banks a monthly fee. Besides offering mobile payments, Turkcell increases its value proposition by offering non-payment services, e.g. loyalty programs, ticketing, rewards or location-based deals (Middleton, 2012).

To diffuse and foster the NFC landscape further, Turkcell is encouraging other MNOs, and its Turkish rivals, to license its mobile payment system. At launch date, the Turkish MNO were benefiting from an existing terminal infrastructure (66,000 units) for contactless payments, where banks and terminal providers have the ambition to increase up to 2 million units over the next few years (Cisco, 2012). However, Turkcell is acknowledging itself that its NFC payment rollout is taking longer than expected. To tackle this hurdle and increase the user base for its mobile payment service, Turkcell started to offer P2P payment service for ordinary phones, based on SMS. It can be assumed that rolling out mobile payments to non-NFC phones could help Turkcell to spur its payment initiative in the mid-term view. Firstly, this would allow it to increase its installed user base while using widely available technologies (SMS). Secondly, later on, these users are prepared to adopt NFC phones, and thus, Turkcell's contactless payments.

Yapital (Disrupter). In March 2012, OTTO, the second-largest online retailer after Amazon, created buzz in the German media by rolling out its own payment system called Yapital. Through its subsidiary Yapital Financial AG, OTTO is planning to offer online, P2P, and in-store payment systems, based on NFC, QR codes or physical payment cards, the latter in cooperation with MasterCard. Yapital's mobile payment platform is specifically designed to be compatible with the existing terminal infrastructure and being independent, to bypass intermediaries (e.g., MNOs). A software update for ordinary payment terminals brings the functionality to display QR codes, which can be afterward recognized by smartphone cameras to process Yapital payments at the checkout counter. To complement and improve the Yapital payment application further, in February 2013, the parent company OTTO acquired for Yapital the mobile commerce company NuBon, which is a specialist in mobile loyalty and couponing. Both companies have plans to exchange their technical know-how, in order to benefit from synergy effects. NuBon is going to integrate Yapital payment functions into their loyalty app, whereas Yapital is interested in integrating NuBon's mobile document and receipt management functionality.

iZettle (Disrupter). In 2011, the Swedish startup iZettle launched smart card readers, capable of transforming iOS and Android devices into mobile payment terminals by plugging a dongle into the headphone jack or dock connector. The Scandinavian startup, which has partnered with several institutional investors and actors from the payment landscape (e.g., MasterCard, American Express, Deutsche Telekom, Nordea), follows the vision to "democratize card payments," empowering small businesses as well as individuals (P2P) to accept card payments. In its second rollout in February 2013, iZettle launched, for merchants only, a chip and PIN payment card reader with a keypad that establishes a connection via Bluetooth to mobile phones. The reason to come up with an additional payment device is that iZettle was forced to disable Visa card payments based on chip and signature authentication, which did not fulfill Visa Europe's safety standards. The unique selling point of iZettle is, besides being easy to use and having a coolness factor, that the billing is solely transaction based (2.75% fee), which does not require lengthy contracts or fixed fees compared to traditional payment providers. The iZettle payment scheme is therefore attractive to small merchants who cannot afford stationary payment terminals. To offer a higher value proposition, iZettle bundles the payment application with a catalogue feature and sales statistic tool, to provide data for sales tracking. Furthermore, iZettle allows, through closed APIs, third-party developers to integrate the payment service into their own apps.

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In Table 2 we perform a comparative-case analysis of the aforementioned payment actors. We use the previous intra-case analyses to identify similarities and differences among the payment actors, in order to ensure generalizability.

Component	Sparkasse (girogo) *Bank*	Turkcell *MNO*	Yapital *Merchant*	iZettle *Startup*
Direct Interaction *Multi-Sided Platform*	The girogo payment platform is *inherently a MSP* that facilitates direct interactions between merchants and cardholders.	Turkcell assumes the role of being a facilitator for direct interactions. Rather than offering its own payment system, Turkcell charges fees or royalties for hosting NFC payment and service applications.	Currently, Yapital is going to offer its mobile payment systems as *a one-sided platform*, since it is only accepted within the OTTO group. Therefore, it cannot be classified as a MSP.	iZettle offers a true MSP, enabling through their payment dongles direct interactions between merchants and individuals, as well as between individuals.
Platform Design *Closed or Open Platform*	To guarantee uniformity, girogo applies a *closed and moderated* system approach that asserts control over platform development and complementary products. Other banks are welcomed to join as platform providers.	Turkcell follows, like girogo, *the closed and moderated* platform approach. Compared to girogo, Turkcell differs by pro-actively inviting third parties, i.e., its MNO rivals, to join its mobile payment platform.	It is likely that Yapital is going after a *closed and moderated* platform approach, to ensure initial system consistency. Besides inviting other merchants to adopt their payment system, Yapital is going to offer closed APIs to selected third parties, to diffuse its payment platform further.	iZettle applies a *closed and moderated* platform approach. Even so, they offer selective access through protected APIs, allowing third-party developers to implement payment functionalities into their app.
Technology Design *Evolutionary & Revolutionary*	The platform owner of girogo pursues an evolutionary product strategy, which supports the existing payment card infrastructure.	By equipping ordinary phones with NFC SIM cards (or enabling SMS payments), Turkcell follows an evolutionary product strategy. On the merchant side, however, contactless payment requires new NFC terminals, hence revolutionary.	Yapital clearly follows with QR code payments an evolutionary product strategy, to be compatible on the customer side (mobile phones) as well as on the merchant side (payment terminals).	Payment dongles and keypads are, by design, evolutionary products that work with existing mobile phones and payment cards (chip/PIN).
Business Design *Platform Envelopment & Schumpeterian Innovation*	Girogo increases its value proposition by bundling its NFC payment card with non-payment application (ticketing). Girogo has a secure moat around its payment service, since NFC payment cards cannot be *enveloped*, due to restricted card access. Once girogo enters the mobile phone as a payment instrument, it faces the risk of envelopment.	Turkcell increases its value proposition by bundling mobile payment with various non-payment services (loyalty). Turkcell has the general risk to be *enveloped*, since the mobile OS is a shared platform with (upcoming) rivals, which are able to circumvent NFC. Turkcell itself assumes the role of a potential enveloper, by offering a multi-platform bundle service to its customer base.	Besides bundling its mobile payment system with loyalty and promotions, Yapital can rely on its parent company OTTO to integrate (*bundle*) Yapital payments with other subsidiaries across the OTTO group. Yapital carries the risk of envelopment, since it shares the mobile handset with potential payment rivals. Contrary, Yapital is in the attempt to envelop bank customers through direct debits.	iZettle bundles its mobile payment service with a catalogue function and sales statistic tool, to increase its value proposition. iZettle has the greatest risk of *envelopment*, because it does not own the payment card and the mobile phone, which can be accessed by rivals. On the other hand, iZettle tries to envelop primarily merchant customers through the aforementioned bundling offer.

Table 2. Comparative Case Analysis

Discussion

Direct Interaction. Three of the four cases fulfil the criteria for being multi-sided platforms that enable direct commercial interactions between merchants and cardholders. In the case of Yapital, however, the current payment platform setting does not classify it as an MSP because this mobile payment system functions only in its own company group.

Platform Design. According to our analysis, all payment actors follow the closed and moderated approach (see Figure 3), where third parties have to submit complementary applications in a controlled manner (usage dimension). Girogo (Sparkasse), Turkcell and Yapital, rigidly control their proprietary payment systems (development dimension), though they are inviting other actors from the same industry to adopt their payment systems, in the hope of diffusing their payment ecosystems further. The payment start-up iZettle is less hospitable to its rivals, offering rather restricted APIs to third-party developers. It can be concluded that the application of the closed and moderated system approach guarantees these actors a unified user experience and control over the distribution of complementary products. All these measures are helping to fertilize newly launched payment platforms.

Technology Design. It can be noted that all actors follow an evolutionary product strategy that promises a smooth migration path to a new payment technology, which is characterized by compatibility, i.e., access to a large and existing user base. Merchants, however, who wish to accept NFC payments (e.g., girogo or Turkcell), are required to deploy new NFC payment terminals. The incompatibility on the merchant side represents a revolutionary hardware approach. Turkcell follows two-track approach. Turkcell realized that the market was not ready for NFC payments. As a result, it scaled back technology-wise by offering SMS payments, which works with ordinary phones. Turkcell's backward compatibility is an attempt to increase the user base in a rapid fashion, and lastly to recruit them afterwards for contactless payments, as soon they have adopted NFC phones or SIM cards.

Business Design. The studied payment actors seek to follow the strategy of bundling their existing payment platforms with various and valuable non-payment applications (e.g., ticketing), to tap new revenue sources, where payment service itself serves primarily as a gateway product. In general, bundling allows platform owners to introduce new technologies, increasing the value proposition, and thus expediting the adoption rate; moreover, it is, in essence, a pre-emptive action to protect their market position and to circumvent envelopment by competitors.

Envelopment. Except girogo (Sparkasse), all other payment actors carry the risk to be enveloped, due to the fact that these actors utilize the mobile phone to introduce their new payment instruments, which are actually owned and controlled by the end user. The consequences are that these new payment instruments share the mobile phone OS (iOS, Android) with other potential payment rivals, i.e., they act more as tenants, where the end user is the landlord. All this leads to a major risk of envelopment. In addition, the NFC technology itself brings the beneficial ability to block subsequent NFC solutions; however, mobile payment applications based on QR codes, which are offered by Yapital (merchant), enable circumvention of these NFC solutions. Girogo has the comfortable position to avoid envelopment while issuing its NFC payment cards. Nevertheless, as soon as girogo enter the mobile payment arena, they are also confronted with the risk of envelopment. The implications are that certain payment technologies can prevent as well as empower platform envelopment, where the mobile phone as a payment instrument presents a risky approach for payment actors.

Theoretical and Practical Implications

By attempting to better describe contemporary digital payment systems, this paper contributes to the payment literature from the multi-sided platform theory angle, to accommodate recent technological developments, with an emphasis on new digital payment platforms. So far, research has extensively studied payment cards as two-sided platforms (Rochet & Tirole, 2002, 2003a, 2003b, 2006). However, the current digital payment arena is developing rapidly. Fuelled by NFC cards or mobile payments,

new payment actors started to create new payment platforms and instruments, which are able to host several services at once. The consequence is that they are transforming these initial two-sided platforms into multi-sided digital payment platforms.

Through our findings, we can hereby answer our research questions, and thereby offer practitioners valuable insights: First, Payment instruments are evolving from being initially two-sided (merchant and cardholder), to multi-sided digital payment platforms, which is achieved by bundling and incorporating third-party services. To capture value from these third parties and to reduce the risk of envelopment, four different platform design strategies (Figure 3) can be applied, where the closed and moderated is the preferred design approach. Second, evolutionary payment instruments (e.g., SMS or QR code) is the preferred technology design approach, that offers as a migration path to a new technology, at the same time access to a ready-made user base. Lastly, to tap new revenue streams, payment actors deliberately bundle their service with (lucrative and data rich) non-payment applications, where payment itself serves rather as a gateway product. Furthermore, a well-thought bundling strategy based on mobile payment may also serve as a ramp for platform envelopment, by leveraging shared customer relationships.

From the practitioner's view, the framework can be utilized to identify or forge different digital payment platform design strategies to increase adoption on the payer and payee side. Secondly, managers can evaluate alternative design paths and strategies (Figure 4), as digital payment platforms evolve and mature over time.

Conclusion

In this paper we have presented the digital payment platform design framework, which has been tailored from existing literature to explain multi-sided digital payment platforms. To provide an answer to our research question, we have performed within the European setting a multiple and comparative case study, by using our framework as an analytical tool to identify similarities and differences among the cases, in order to create theoretical generalizability.

This paper pinpoints the following key findings on how payment incumbents and disrupters design digital payment platforms, and which design choices they have: (1) Payment instruments are evolving from being initially two-sided (merchant and cardholder), to multi-sided digital payment platforms, which is achieved by bundling and incorporating third-party services. To capture value and to reduce the risk of platform envelopment, four different platform design strategies can be applied, where the closed and moderated is the preferred design approach. (2) Evolutionary payment instruments is the prevailing technology design strategy, which is compatible with an existing user base and to its payment infrastructure, promise low switching costs. Revolutionary payment instruments (NFC mobile phones) offer compelling services, but faced with low adoption on the user side and incompatibility on the merchant side. (3) Lastly, to tap new revenue streams, the studied payment actors bundle their service with non-payment services, where payment acts as a gateway product. Combined with an elaborate bundling strategy, it may lead to platform envelopment, in other words, a Trojan horse attack.

Future studies could address our limitations, since we showcased newly launched payment systems, where the current setting (e.g., technology design) might change. In addition, we were not able to study clashes between payment incumbents and contenders, not to mention potential antitrust issues, or the entrance of global players like Google or Apple, which have already disrupted other established industries. Finally, studies could also investigate the relationships between payment platforms providers and third-party developers.

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