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Adoption of Mobile Payment Platforms: Managing Reach and Range

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Abstract

Numerous mobile payment solutions, which rely on new disruptive technologies, have been launched on the payment market in recent years. But despite the growing number of mobile payment apps, very few solutions have turned to be successful as the majority of them fail to gain a critical mass of users. In this paper, we investigate successful platform adoption strategies by using the Reach and Range Framework for Multi-Sided Platforms as a strategic tool to which mobile payment providers can adhere in order to tackle some of the main challenges they face throughout the evolution of their platforms. The analysis indicates that successful mobile payment solutions tend to be launched as one-sided platforms and then gradually be expanded into being two-sided. Our study showcases that the success of mobile payment platforms lies with the ability of the platform to balance the reach (number of participants) and the range (features and functionalities) of the platform.

Keywords: Mobile payments, Multi-sided platforms, Platform adoption, Platform strategy, Case studies

1 Introduction

The rapid proliferation of Ubiquitous Information Systems has tremendous potential to transform our day-to-day activities due to the ability of such systems to interact with their surrounding environment [46]. The smartphone, which is heralded as the first pervasive computer [5] p.1, is an example of such a ubiquitous information system. Smartphone's portability, high degree of connectivity and its capability of incorporating numerous functionalities offered by device manufacturers and third-party developers alike significantly enhance the smartphone's use anytime, anywhere and in any context. Consider that the smartphone is in the midst of absorbing navigation devices (GPS), mp3 players and cameras, not only as separate physical objects, but also as separate business sectors [23]. The annexation quest of this digital device is advancing and it has already set its target on payments [23]. While the smartphone has managed to triumph over the portable camera as the preferred method to record memorable occasions under the form of photos and videos [37], the adoption rates of mobile payments continue to remain low in spite of the fact that the first mobile payment having been executed more than 20 years ago [29].

Despite the rapid spread and adoption of smartphones and the emergence of a huge array of mobile payment solutions, the much proclaimed mobile payment revolution still has not taken place as most consumers still prefer to pay with plastic cards and cash [14]. Indeed, the majority of the launched mobile payment apps have failed to gain a sufficient number of users as consumers are hesitant to adopt digital payment services [29]. Most of these solutions try to attract both users and merchants on board simultaneously, which proves to be a cumbersome task. In reality, the adoption of mobile payments is a complex process characterized by numerous strategic challenges which a payment provider needs to address [23], [35]. In this paper, we investigate mobile payments as digital multi-sided platforms that facilitate the recurring interactions between various constituencies [20]. We argue that instead of just focusing on reaching a critical mass of users, a mobile payment provider should pay more attention to nurturing platform interactions in order to spur the adoption of mobile payment platforms. Thus, we formulate the following research question:

What strategies can a mobile payment platform provider adhere to in order to drive the adoption of its solution?

The main objective of this paper is to outline the strategies to which mobile payment platforms can adhere to in order to ensure their adoption. In order to do so, we further investigate and expand the Reach and Range framework for multi-sided platforms (MSPs) which we initially introduced in a paper presented at the 14th International Conference on Mobile Business. We then demonstrate the usefulness of the Reach and Range framework for MSPs as a strategic tool for tackling some of the main challenges a mobile payment platform faces throughout its evolution. To this end, we apply the Reach and Range framework to three selected cases and use the findings of our case analysis to prescribe several strategic approaches to which mobile payment providers can adhere in order to spur the adoption of their solutions. Our analysis reveals that the success of digital payment platforms is determined by the ability of the platform owner to balance the *reach* and *range* of each of the affiliated with the platform sides and to manage the interside *reach* and *range* which characterizes the interaction across the platform sides.

This paper proceeds as follows: First, we outline the theoretical foundations of this paper. We, then, present the Reach and Range Framework for MSPs as a mechanism that can be used to address the most pressing strategic issues a platform faces. As a next step we briefly introduce the three investigated cases and analyze them using the Reach and Range Framework for MSPs. In the final sections of the paper, we discuss our findings, offer some conclusions and suggest promising areas for further research.

2 Mobile Payments as Multi-Sided Platforms

We draw on the literature on multi-sided platforms, which is rooted in the field of industrial economics, as theoretical lens to investigate mobile payment solutions. Despite the growing literature on MSPs, there is often confusion as to the exact difference between one-sided, two-sided and multi-sided platforms. The problem stems from the lack of a clear definition [20], which leads to an overlapping in the way that two-sided and multi-sided platforms are defined [12], [20]. In this paper, we view platforms as systems that create and facilitate interactions between one or multiple customer groups connected to them [20]. We also adopt a clear distinction between one-sided (enabling interactions between participants of one distinct group), two-sided (enabling interactions between participants of two distinct groups) and multi-sided (interactions between participants of more than two distinct groups) platforms [36].

Mobile payment solutions function as digital platforms that facilitate the direct interaction between various customers affiliated to them [11], [20], [23], [28], [35]. More often than not they are launched as one-sided platforms and gradually evolve to being two-sided, and eventually, multi-sided [36]. This is in contrast to payment cards which are traditionally launched and function as two-sided platforms that enable the interaction between merchants and consumers and remain two-sided so far [12]. Unlike traditional payment platforms, such as credit and debit cards, digital payment platforms are extremely scalable with high development costs and low marginal costs. As costs remain fixed throughout the platform's evolution, the extensive adoption of a platform affects positively the value of the platform to all affiliated constituencies [8]. This means that once the payment platform is developed, it costs very

little to add and service additional users. Thus, payment platforms exhibit significant economies of scale as the initial development costs remain fixed and are gradually distributed across the growing number of platform participants. This observation, however, is valid only when the mobile payment solutions are software-based, that is they function as payment apps enabling P2P transactions. When such solutions are used to execute consumer-to-business (C2B) transactions, they require a merchant to be equipped with a compatible hardware (e.g., dongles).

The research on digital payment platforms mainly encompasses studies on payment platform design [23], business models [7], factors leading to platform failure [16], transformation of the digital payment ecosystem [21], and payment platforms' evolutionary models [36]. Significantly less emphasis, however, is placed on investigating strategies for successful entry into and expansion of digital payment platforms [35]. We address this research gap by determining the strategies that platform providers can adopt in order to address the strategic challenges they face during entry, as well as subsequent expansion of their platforms.

MSPs value generation ability lies in the platform's capability to enable multiple interactions that occur with high frequency among the affiliated to the platform participants [20]. In order to do so, platform providers need to create and manage network effects that occur when users perceive an increase in the value of a product or a service as a result of the growing number of participants [33]. The concept of same-side network effects presupposes that consumers may find a product or a service more useful if similar consumers use that product as well. An example of this is the fax machine which has no value of its own, as it requires the presence of other fax machines. At the same time, the usefulness of the fax machine for a user grows as the number of fax machines increases, since the user can communicate with a larger number of other users. Cross-side network effects exist when users value the presence of other distinct groups of platform participants. For example, most credit cards function as two-sided platforms because they facilitate the interaction between two distinct groups of participants - buyers and merchants [11]. As the number of payment card holders increases, more merchants begin to accept this form of payment in order to attract buyers to their shops and vice versa. Platforms are also characterized by homing costs, which are related to the adoption and/or any form of affiliation with the platform [3], and by switching costs, or the costs which consumers incur when shifting platforms [33].

Digital platforms prove to be complex systems that evolve gradually over time [42]. Platform's evolvability, however, has remained an elusive topic in the research on MSPs, with only few models and prescriptions guiding the platform throughout its evolution. Evans [11], for example, proposes a two-stage model to explain a platform's market entry and growth, anchored around platform's ability to achieve a critical mass of users. A key threshold for every platform is swiftly gaining a critical mass of users, which is defined as a sufficient number of users who have joined the platform and are transacting within the platform with high frequency [17], [33]. Evan's model presupposes that during the first ignition stage, customers are affiliated with the platform in order to evaluate its main value proposition [11]. In the second *growth* phase, after the platform has managed to attract a substantial number of participants, the platform can rely on the already achieved network effects to spur further growth and to ensure its endurance. In order to achieve critical mass, Evans [11] recommends a zig-zag strategy where a platform owner gradually attracts and facilitate simultaneously the participation on both sides of the platform. The platform usually launches with a limited number of participants on both sides and grows over time. Another model, which provides an insights into the platform's evolvability, is proposed by Hagiu [19], who emphasises on the platform's gradual transition from being one-sided to two - (or multiple) sided platform. Before a platform can embark on an expansion quest, it should first achieve platform depth by designing and deploying value-creating functionalities that will bring benefits to the those affiliated with the platform participants [19]. The achievement of platform depth serves as a prerequisite for the subsequent platform expansion when new constituencies join the platform, thus extending the platform's breadth. Tiwana [42] points out that a platform's evolution requires constant adjustment of the platform's architecture and governance as the platform matures over time. Tiwana [42] p.162 also proposes various *evolutionary metrics*, which measure platform performance over the span of its evolution. In particular, he states that in the short term, platform owners should focus on measuring platform resilience, scalability, and composability, and then move on to tracking platform stickiness, synergy, and plasticity; and concentrating on envelopment, durability, and duration in the long term. While Evans [11] and Hagiu [19] discuss stage models in order to structure platform evolvability, Tiwana [42] focuses on concrete measurements to estimate the speed and effectiveness of platform evolution (that is evolutionary metrics). There is, however, a lack of an analytical model that brings the three views together (a stage model with concrete strategic thresholds for each stage) serving as a strategic tool to guide platform evolution by helping a platform solve some of its main strategic challenges.

3 The Reach and Range Framework for Multi-Sided Platforms

In this section, we briefly identify some of the most pressing strategic issues which platform providers face throughout the evolution of their platforms. Most of the research literature on multi-sided platforms focuses on pinpointing some of the strategic issues as well as prescribing certain rules that need to be taken into consideration when a platform owner designs and launches its offerings (e.g., pricing mechanisms, governance rules and design rules). There is, however, a lack of an overall principle or framework to guide the platform owner when addressing successfully and in a holistic manner the main strategic challenges throughout the platform's evolutionary path. To address this gap in the literature on MSPs, we develop the Reach and Range Framework for MSPs as a strategic tool that platform owners can use when designing their launch and expansion strategies.

3.1 Strategic Issues of Multi-Sided Platforms

As multi-sided platforms are characterized as being highly evolvable systems, they tend to evolve over time by introducing various modifications to their initial platform design (i.e. additional features, or more participants) [42]. As platforms pass through different stages throughout their evolutionary path, however, they face new strategic challenges and considerations that need to be addressed in a prompt and timely manner [35]. In this paper, we argue that the challenges which a platform owner faces are pre-determined by the specific design of the platform upon its launch. Thus, the challenges that a one-sided platform needs to solve differ to a certain degree from the challenges which the platform needs to tackle as it transforms into being two-sided [42]. This evolutionary approach allows for a platform owner not having to face all the strategic challenges at once, but instead can address them step by step [19].

Although the strategic challenges, which a platform faces, have been rightfully identified in the existing literature on multi-sided platforms, we try to identify some of the main specific strategic considerations associated with the separate stages of a platform's evolutionary path. We use the overview of these challenges as a useful vehicle for guiding the application of the Reach and Range Framework for multi-sided platforms for solving some of these considerations. We will address this issue more thoroughly in the Discussion section. In order to synthesize the existing strategic considerations, we adopt a two-step approach. First, we summarize the existing literature on MSPs in order to single out the existing strategic challenges and strategic goals, which need to be attained. In the second stage, we consult the data we gathered from conducting interviews with various payment experts over the span of two years in order to pinpoint the challenges that payment platforms tackle during the different stages of their evolution.

The main strategic challenge of a one-sided platform is to gain a critical mass of users after its launch; hence, the platform owner has only one distinct group of participants to cater to at this stage. However, a platform owner should be aware that one-sided platforms tend to offer a limited number of functionalities [35]. Thus, due to their relatively weak value proposition, one-sided platforms can easily be attacked by other players, who can easily imitate their offerings. This poses a significant threat to the durability of one-sided platforms, as the platform cannot generate enough lock-in effects in order to ensure that its platform's users will not multi-home to other platforms or even switch entirely to other solutions. In order to address this shortcoming, which is intrinsic to the design of the one-sided platforms, a platform has to strengthen its value proposition by adding a second distinct group of participants, thus transforming into being two-sided. As a one-sided platform achieves a critical mass of users, it becomes attractive to other actors wanting to gain access to the participants already affiliated to the platform [11].

As the complexity of the platform design increases, a platform faces several strategic challenges [41]. The platform owner thus needs to develop and deploy various mechanisms so as to ensure that the size of the second group of participants grows continuously. Another critical issue is achieving platform stickiness by creating strong lock-in effects for the first affiliated group of participants [33]. Apart from catering to each of those affiliated to the platform group of participants, a platform also needs to put efforts into creating and sustaining platform recurrence, which we define as the ability of the platform to achieve significant cross-side network effects by stimulating high volumes of transactions between the affiliated sides [30]. The presence of a second group of participants allows a platform owner to try to devise a viable business model by determining a platform's subsidy and revenue side [19]. The next step of the platform's evolutionary path is to achieve a platform variety of offerings in order to ensure even greater platform stickiness and strengthening of the platform's value proposition [42]. To do so, a platform can benefit from the innovative potential of numerous external complementors who can become affiliated to the platform, thus transforming it into being multi-sided [19]. A key issue at this stage of the platform's evolution is for a platform owner to bolster the platform's defence, thus preventing a possible envelopment attack [9].

3.2 Reach and Range Framework for Multi-Sided Platforms

The Reach and Range Framework for MSPs is based on Keen's Reach and Range Framework for IT platforms [24] where he introduces the concepts of *reach* and *range* to study the business features of an IT platform. For Keen [24] reach determines the IT platform's ability to connect people, while range, as defined by Weil and Broadbent [44] who extend Keen's initial definition of range, detects the different functionalities of certain business activities on the IT platform. The Reach and Range Framework as proposed by Keen [24], [25] constitutes a useful tool for planning and guiding the expansion of an IT platform. As we are seeking to investigate the entry and expansion strategies of MSPs, we view Keen's framework as a useful theoretical underpinning to develop an analytical tool in order to study further the MSPs expansion. To this end, we adapt Keen's Reach and Range framework to reflect the main characteristics of MSPs in an attempt to map out the participants affiliated to the platform and the various functionalities in which they can take part.

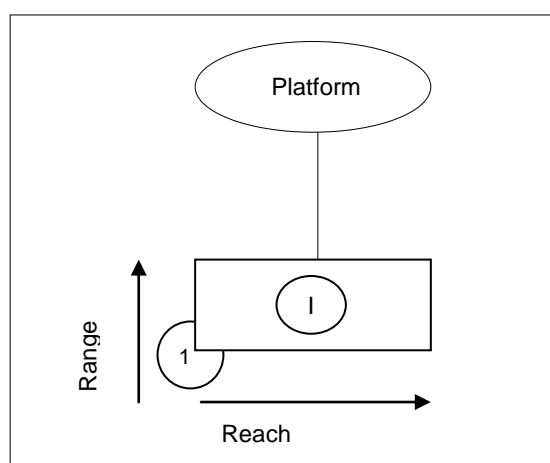
There are several differences between Keen's framework and the Reach and Range framework for MSPs. First, the domain of application of the two frameworks is different. Keen's framework is anchored around the IT infrastructure of a firm, while the MSP framework is applied to digital platforms. Second, while we borrow Keen's terminology of *reach* and *range*, we provide new definitions of these terms in order to reflect the logic of MSPs. For example,

Keen's definition of *reach* comprises business units, suppliers, geographical locations, customers etc. While, we adopt the main assumption behind the term *reach* (people connected through infrastructure, or platform in our case) [24], [25], we do not identify platform *reach* with business units or geographical locations (see below). Finally, by applying the MSPs logic to Keen's Reach and Range framework, we introduce a new conceptual layer to the initial framework (e.g. network effects, multi-homing, direct interaction between affiliated platform sides etc.).

The main purpose of MSPs is to enable cross-side interactions between distinct groups of participants affiliated to a platform in order to create, capture and distribute value [18]. Thus, the main goal of a platform is to increase not only the frequency of the interactions among the different participants affiliated to the platform but also the type of interactions within each of the platform sides and across several sides. In order to achieve this, a platform provider faces a number of strategic challenges, which require that certain strategic choices need to be made regarding the affiliation of the different sides to the platform as well as the features and functionalities offered on the platform throughout its evolutionary path. In this paper, we argue that the Reach and Range framework for MSPs can serve as a useful strategic tool to guide platform owners in tackling the key strategic challenges, identified above (see section 3.1.).

At the core of the Reach and Range framework for MSPs is the assumption that every platform side can be characterized by its *reach* and *range*. When *reach* refers to a platform's side, it represents the number of participants of one distinct group affiliated to the platform. *Reach* can also refer to the overall platform's *reach*, which is a sum of the *reach* of each distinct group of participants affiliated to the platform. *Range*, on the other hand, encompasses the features and functionalities associated with a particular side or several sides. Thus, by combining all the features offered by the various sides and across the sides, we can estimate the overall platform's *range*. The concepts of *reach* and *range* are interconnected and the success of both depends on the right timing within which they are executed. A platform provider usually designs and offers a specific set of features (*range*) in order to attract more participants (*reach*) or to lock-in existing customers. In this way, a platform expands its *range* in order to increase its *reach*. On the other hand, if the number of participants increases (*reach*), but the platform has a limited number of features (*range*), a platform provider needs to guarantee further entrenchment of the already joined participants by offering new features and functionalities (*range*), resulting in more reoccurring interactions. Thus, a platform provider needs to strike a balance between the *reach* and *range* in order to create and manage multiple reoccurring interactions, which are the main generators of value for the platform.

Figure 1: Overview of reach and range for one-sided platforms



Upon their launch one-sided platforms (Figure 1), cater to one distinct group of participants (I), exhibiting same-side network effects (1). Initially, a one-sided platform offer a limited number of features (i.e., it is characterized by a limited platform *range*) in order to attract potential users. As a platform needs to gain a critical mass of users or a certain number of participants in order to become viable, a platform provider adds features that will attract more users, thus expanding the platform's *range* in order to increase the platform's *reach* (see Figure 1). As a one-sided platform gains a critical mass of participants, it comes to a point of saturation, which slows down the growth of a platform. A platform provider may then decide to stay in such a position, as the one-sided platform has already become viable in terms of achieving same-side network effects (but not necessarily being economically viable) after it reaches critical mass. However, as one-sided platforms are particularly vulnerable (see section 3.1.), a platform provider may decide to expand the platform by adding a new distinct group of participants to its early value proposition, thus transforming the platform into two-sided one.

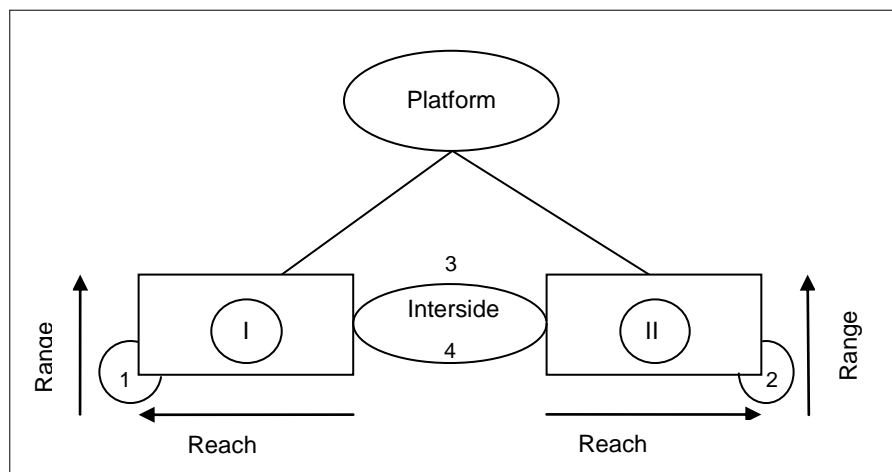
Two-sided platforms (see Figure 2) facilitate the interactions between two distinct group of participants (I and II) [16], which are characterized by cross-side network effects (3+4) [33]. Just as for the first group of participants (I), the second distinct group of participants (II) is also characterized by its own *reach* and *range*. Each of the platform sides is also characterized by same-side network effects (1+2). A platform provider needs to manage the *reach* and *range*

of each side in order to increase the number of participants and functionalities associated with a particular platform constituency. The transformation from a one-sided to two-sided platform also implies that the overall *reach* and *range* of the platform now consists of the *reach* and *range* of both sides of the platform (I+II) (see Figure 2).

At the same time as a two-sided platform creates and nurtures cross-side interactions, a platform provider also needs to balance the *reach* and *range* across the different distinct groups of participants (Interside reach and range, see Figure 2). For example, the more credit card holders that join a payment platform, the more merchants will participate. Thus, the change in the *reach* in one of the platform's sides results in expansion of the *reach* on the other side and vice versa. A platform's interside reach is associated with the functionalities and features which enable cross-side interactions (e.g., functionalities to execute C2B transactions - QR code scanner, receipts, loyalty, etc.). A platform may also expand its interside *reach* by launching a platform envelopment attack, that is a platform can imitate functionalities offered by other platforms and add them to its existing offering [9], [10].

The leveraging of the platform's *reach* and *range* can also indirectly help determine the platform pricing strategy (i.e. platform's subsidy and revenue side, see [12], [13], [18]). One-sided platforms usually do not possess a viable business model (e.g., Facebook, LinkedIn and Youtube struggled initially to generate revenue before expanding their services) as platform providers aim to stimulate users' adoption by making the platform's value proposition optimally attractive. As part of its evolutionary path, a one-sided platform adds a second distinct group of participants that values the access to the already established platform's user base, thus constituting a potential source of revenue for the platform. In order to provide such access, a platform owner needs to design features that support interactions between the two affiliated groups of participants [18]. By designing new features that enable the execution of such cross-side interactions, the platform extends its interside range.

Figure 2: Overview of reach and range for two-sided platforms



Even though a two-sided platform manages to optimally balance its reach and range, and eventually succeeding in defining a viable business model, it should further reconsider its current design in order to prevent potential envelopment attacks from other players [9], [23]. A platform can find itself under the threat of being enveloped by rival platforms if it cannot achieve platform stickiness and fails to ensure significant platform reach (enough number of participants affiliated to the platform). This can be attributed to the mismanagement of platform reach if a platform owner has designed functionalities that are not recurring with high frequency. To prevent the threat, a platform owner needs to reinforce its defence by further diversifying its value proposition. Such a diversification can be achieved through attracting numerous external complementors [42] who can offer innovative services to the platform's users, thus expanding the platform's reach (number of affiliated distinct group of participants) and range (the platform's functionalities). At this stage of its evolution, a platform consists of multiple sides, each of which has its own *reach* and *range*, thus making the management of the platform extremely complex.

4 Method

In order to provide an answer to our research question, we use a qualitative research method utilizing case study analysis. Thus, our study adopts an explorative research approach of digital payment platforms with three cases of successful mobile payment solutions. Case studies aim at providing in-depth understanding of complex phenomena by allowing researchers to analyze them within their context of emergence and existence [6], based on collection and detailed analysis of various data sources [45].

4.1 Case Selection

In this paper, we aim to define strategies that platforms can use in order to spur their adoption. To this end, we investigate the usefulness of our framework to address the main challenges that platforms face throughout their evolution. Thus, we concentrate on studying mature digital payment platforms with a well-established evolutionary path. The platform's ability to advance successfully on its evolutionary path is a vital indicator for the platform's endurance, which ultimately is what distinguishes successful from non-successful digital payment platforms. Selecting such successful digital payment platforms for the purposes of our study, however, proves to be a challenging task, as most of the launched mobile payment apps have failed to reach critical mass of users and, as a result of this, have been discarded. Nonetheless, in the last few years, a few solutions have been successfully launched and have managed to establish a clear-cut evolutionary path. Digital payment platforms, such as Pingit offered by Barclays bank in UK and MobilePay offered by Danske Bank in Denmark, have acquired a large number of participants and have continued to evolve at a stable pace, diversifying their functionality portfolio and affiliating more constituencies. Thus, we choose to investigate them as examples of mature digital payment platforms.

Pettigrew [31] does not recommend relying exclusively on similar cases to investigate a phenomenon, and we also include a unique case study - Swish, a solution jointly developed by some of the largest financial institutions in Sweden, which is dissimilar to the initially selected Pingit and MobilePay. As Swish has different design from the two other solutions, as it is offered jointly by several banks in Sweden, which all need to achieve consensus about the entry and expansion design of the solution, it is an interesting case to investigate as it is in contrast to the other selected cases. We undertake this approach in order to test the robustness of our framework by investigating whether the model can be replicated across various types of cases (different characteristics of the solutions across three different markets) and to study whether the framework can be expanded further by incorporating new insights. In the Discussion section, we briefly present two unsuccessful solutions, Paii in Denmark and Bart in Sweden, which no longer exist. The two solutions serve as further illustration of the explanatory power of the framework and are not part of the analysis, which leads to the formulation of the different strategies in the Discussion section.

4.2 Data Collection and Analysis

The research in question in this paper is of a process nature, as it focuses on understanding the evolution of various concepts over time [26]. Thus, the data we gathered are comprised primarily of separate stories which describe events occurring over a span of time [43]. The data we gathered took place in the span of eight months and were coded in order to identify the specific evolutionary path of the three selected platforms.

Our research is informed by both primary and secondary data. We collected primary data for MobilePay by conducting interviews with senior managers in the period April-May 2014. One of the senior managers was in charge of the initial launch of MobilePay and its future development. The second senior manager was responsible for consulting the future development of the mobile payment solution in terms of overcoming strategic challenges and taking into account existing strategic opportunities. The duration of each of the interviews was one hour. The interviews were conducted based on semi-structured questionnaire and contain insights about the rationale behind the specific design choice of MobilePay upon launch and during its subsequent evolution as well as insights about some of the strategic challenges that the solution needed to overcome over time. It was possible to collect primary data only about MobilePay as we managed to get access to senior managers only in this case. In order to construct the exact evolution of MobilePay, we further consulted secondary data, such as press releases and news articles.

A significant amount of secondary data was also collected. The data we gathered for Pingit and Swish were exclusively secondary. We consulted publicly available sources: press releases, annual reports, online news and interviews. The collected data contained information about the launch of both solutions as well as information about their subsequent evolution, namely introduction of new features, user base, promotional campaigns and business models. The gathered data allow us to map out the evolution of each of the solutions. Two of the apps (MobilePay and Pingit) were also installed on the researchers' phones so that better insights into the apps' functionalities could be obtained.

To analyse the gathered data about the three selected cases (MobilePay, Pingit, and Swish), we applied a qualitative content analysis based on developing coding schemes and analysing the gathered text [22]. The coding scheme we developed is informed by previously defined theory, namely the Reach and Range Framework for MSPs. The coding scheme consists of two main codes (one-sided and two-sided platforms) and three sub-codes *reach*, *range* and *interside reach and range*. We coded the data by first identifying the stage of the platform evolution (one-sided or two-sided) and then we identified the *reach* and *range* for each of the identified platform sides as well as the interside *reach and range*. *Reach* encompasses all the information with regards to user base on each side of the platforms as well as the overall number of users on the platform. *Reach* was also identified as different types of platform participants (e.g., different types of merchants). *Range* was coded as features and functionalities introduced to the platform's initial value proposition. Small app releases, introducing security updates or bug fixes, were omitted from the coding as they refer to app maintainance and do not reflect the platform evolution (see [42]). Thus, any change in the platform was coded as *reach* or *range* if it was part of the evolutionary path of a platform.

5 MobilePay

Danske Bank's MobilePay app is a bank-operated, card-based mobile payment solution allowing users to transfer money from a card to a bank account via a mobile phone number and a PIN code. The app was launched in May 2013 and has proved to be extremely popular among the Danes as more than 50 per cent of the adult population has downloaded it since its launch. Currently the app has three million registered users. Initially, the solution was launched as a one-sided platform catering to the needs of one distinct group of participants (that is, users). After MobilePay managed to attract a critical mass of users, it added a second group of participants by opening up to small merchants in October 2013.

5.1 MobilePay as One-Sided Platform

MobilePay was launched as an one-sided platform facilitating the interaction between a sender and a receiver, thus forming one distinctive group of users with interchangeable roles (user A can send money to receiver B; the next day B becomes the sender by sending money to A).

5.1.1 Range

The MobilePay app allows a user to transfer money to another user by relying only on the recipient's phone number, thus eliminating the need to exchange complicated bank details. Initially, users could send no more than 201 EUR per day to other users (Site 1). A new version of the app was released in September 2013, just five months after the initial launch. The updated app introduced new features such as 'split the bill' and allowed for higher amounts per transaction. The introduction of these new features is a concrete step to increase the *range* of the app in order to increase the frequency of the interactions (i.e. by enabling the new use of 'split the bill') and achieve lock-in effects. The increase of the *range* is also aimed at attracting more users, thus strengthening the same-side effects.

5.1.2 Reach

The app targets both Danske bank customers and non-Danske bank customers that contributed to its high adoption rate, with almost 300.000 people installing the app on their devices during the first two months after launch. The non-Danske Bank customers, who use the solution, constitute approximately 70 % of the overall user base of MobilePay. Danske Bank put considerable effort into attracting new consumers and growing its user base. The app was initially developed only for iPhone and Android devices. Users were also able to send money to receivers who initially had not downloaded the app, and, who in order to claim the money, had to sign up for the app. Getting a critical mass upon launch and reaching as many users as possible were critical for the success of the solution. Thus, during the first few months after the launch of the solution, efforts were focused on gaining a significant user base with strong same-sided network effects.

5.2 MobilePay as Two-Sided Platform

As MobilePay managed to attract a significant number of users by expanding its *range*, it gradually became attractive to small businesses that form another distinctive group of participants who wanted access to the large user base of the app. Thus, by adding first small merchants and later big retail chains, MobilePay transformed from being a one-sided platform to being a two-sided platform, thereby creating cross-side effects.

5.2.1 Interside Reach and Range

In October 2013, Danske Bank started a trial period with selected small merchants (coffee shop owners, hot dog stand owners, and taxis) that could accept payments from customers. Small merchants had already been using MobilePay to execute transactions at flea markets, as the solution was perceived to be cheaper and easier to use as opposite to existing payment options. After the successful pilot, MobilePay solution for businesses was launched in February 2014. As most of the MobilePay users used the service to transfer small amounts, it was considered logical to first test low-value consumer-to-business (C2B) payments. The solution uses the businesses' phone number to execute the transaction with shop owners being equipped with a smartphone with a MobilePay app. After the money is transferred from the consumer's bank account, he or she gets a receipt with the company's name, logo and time of payment on it (Site 1). At the same time businesses can easily verify the transactions and the overall amount of money sent to them, display their logo on the receipt, export transaction data, and point out to consumers the location of their shops. Thus, with the introduction of new platform interactions (between users and business), a platform needs to design features that support these interactions on both sides (interside range).

In June 2014, a coffee shop in Denmark incorporated MobilePay as a payment method in its own app [1], thus expanding MobilePay's *range* by enabling new ways of using the app. In July 2014, MobilePay entered the e-commerce sphere by partnering with five online stores which now use MobilePay as a payment method. Danske Bank continued to bring more merchants to the solution by enabling online shops to use MobilePay as a payment method. The expansion of the MobilePay's range was further reinforced in July 2015 when large retail chains

introduced MobilePay in their stores, thus further expanding the *range* of the second platform side. Unlike the solutions for small merchants and online shops, payment transactions with MobilePay in large retail shops can be executed much faster and more conveniently with the help of Near Field Communication (NFC) and Bluetooth technology. Thus, MobilePay's platform interchange range is supported by various solutions. In 2015, MobilePay also launched a pilot of a loyalty concept called Bonus, allowing users to collect and redeem loyalty points with selected merchants, thus enhancing a platform's interside range. Platform's interchange reach is determined by the adoption rate of C2B transactions (i.e. the number of users paying merchants with MobilePay). We could not obtain such numbers for MobilePay.

5.2.2 Merchant's Reach and Range

MobilePay gradually extended the *reach* of the second distinct group that was added to its initial value proposition. Initially, the solution for businesses targeted only small merchants and consisted of an app that needed to be installed on the merchant's smartphone. As of September 2014, approximately 1,975 small business places, such as coffee shops, clothing companies, hairdressers, bike repair shops, doctors etc., had adopted the solution. Later, MobilePay was incorporated as a method of payment on the websites of various online shops, and thus the *reach* of the business side was extended to encompass Internet retailers. Initially, big retailers were reluctant to use MobilePay in the same way that small merchants do mainly due to the high volume of transactions a larger retailer has to process in a quick and efficient way. Thus, MobilePay had to design different functionalities if it wanted to bring large retailers on board. After a few months of trial, the large retail chains in Denmark launched MobilePay. Thus, MobilePay's *reach* on the business side was gradually extended to encompass small merchants, online traders and large retail chains. The extension of the *reach* was facilitated by the introduction of new features for each of the business types, thus expanding the *range* of the platform's business side (see above).

5.2.3 Users' Reach and Range

As merchants were attracted to the sheer size of the MobilePay's installed user base, the platform owner needed to continue growing the number of active users (i.e. expanding the reach of the first platform constituency), while also focusing on growing the platform participants which form the second constituency. Although MobilePay put significant effort into attracting merchants to join its platform, it also continued growing its installed user base by managing both the *reach* and *range* of the user side (see Table 1). To cater to its user base, MobilePay increased on several occasions the daily payment limits, introduced photos and personal messages when users sent money, added profile photos (*range*) and also launched a MobilePay app for Windows Phones (*reach*) (see Table 1).

Table 1: Overview of mobilepay's reach and range

MobilePay			
One-Sided Platform	Side 1 (Users)	Range	P2P payments Increase payment per transaction limit Split the bill
		Reach	All banks customers 15-years old iOS, Android
Two-Sided Platform	Side 1 (Users)	Range	Increase daily payment limit Photos to receipts Messages to receipts Profile Pics
		Reach	Windows Phones
	Side 2 (Merchants)	Range	Mobile Business App with functionalities for merchants MobilePay Button in third-party apps NFC/Bluetooth device at check out
		Reach	Small merchants Online retailers Large Retailers
	Interside	Range	C2B transactions Bonus
		Reach	Number of C2B transactions (non-disclosed)

6 Pingit

In 2012, the UK-based Barclays bank launched its peer-to-peer transactions (P2P) app Pingit which allows one user to send money to another user fast, easily and efficient. The service is available for Barclays' customers and non-customers as long as they have a UK current bank account and a UK mobile phone number. Approximately 4.2

million people have signed-up for the service since its launch. Pingit has also managed to attract 67 000 businesses so far [27]. Initially, Pingit was launched as a one-sided platform and later expanded to become two-sided in May 2012.

6.1 Pingit as One-Sided Platform

Pingit was first launched as a payment app enabling P2P transactions between a receiver and a sender who are subject to same-side network effects. The more people use the app, the more valuable it becomes. As the sender and receiver of P2P payments can change their roles easily, they form one distinct group of users. Thus, upon its launch Pingit functioned as one-sided platform.

6.1.1 Range

Upon its launch, Pingit's main functionality was to enable P2P payments among Barclays' bank account holders who can select the recipient's phone number, enter the amount they wish to transfer and press the send button (Site 2). The app allowed users to split the bill, send a personal message and receive a SMS confirmation for each transaction. App users could also set up and customize their profile by adding a photo. In May 2012, Barclays extended its value proposition by introducing features which allow for better user account management (e.g., integration with current accounts, operation of joint accounts, adding several phone numbers to one user profile), thus expanding the *reach* of the platform. By increasing the number of features offered by the app, Barclays aimed at creating more interactions on the platform, thereby driving value for the app users. At the same time, the introduction of new features is directed not only towards more interactions within current app users, but also towards attracting more users. Thus, by increasing the *range* of the app, Barclays also tried to increase its *reach*.

6.1.2 Reach

Upon its launch, Pingit was available only to Barclays' bank account holders who can use the app to send P2P payments. Payments, however, could be received by both Barclays and non-Barclays customers, with the latter having to log-in to a website to claim the transferred Money (Site 2). Initially, the app was available only to Barclays' customers over 18 years old who had iOS, Android or Blackberry devices. Just a week after its launch, approximately 120 000 people signed for the payment app [34]. Following the successful launch, with two subsequent updates in February and April 2012, the app was expanded beyond Barclays' customers and was made available to anyone in Britain over the age of 16 years with a current UK bank account. Furthermore, in July 2014, Pingit became available for Windows Phones devices. Thus, Barclays had extended the platform's *reach* by changing the rules of access to the platform and by making the app available across multiple devices.

6.2 Pingit as Two-Sided Platform

By adding new functionalities and easing the rules for platform access, Pingit's user base grew significantly and reached 1,8 million users within a year and a half. As Pingit's user base grew in size, it became attractive to small businesses that form a second distinctive group of users who paid to get access to the installed user base. As Barclays started to add various small and large businesses, the app was transformed from being one-sided to being two-sided. Thus, Pingit still needed to design strategies for managing two sides (users and sole traders) each of which would have its own *reach* and *range*.

6.2.1 Interside Reach and Range

In May 2012, Pingit enabled its users to pay to sole traders such as carpenters, plumbers and beauticians by scanning a QR code on their bills, thereby eliminating the need for exchange of bank account details. With the introduction of the *Pay Now with Pingit* button to third-party apps and the *Buy it* button in the Pingit app in September 2013, the app allowed users to connect to merchants, thus enabling the possibility for more types of platform interactions. In November 2013, Barclays retooled its Pingit app to enable large firms to send funds for insurance claims, utility refunds and other corporate payments directly to consumers. Even though Pingit was extended to cover B2C payments, the app still functions as a two-sided platform, as it facilitates the interactions between two platform constituencies (users and merchants).

6.2.2 Merchant's Reach and Range

By bringing sole traders on board and enabling the interactions between users and small businesses, Pingit became a two-sided platform and started building the *reach* of its second side. The management of the *reach* and *range* for businesses required strategies for attracting more business owners (*reach*) and introducing features that would attract various types of businesses to the platform (*range*). In 2013, Barclays announced that Pingit could be used for paying utilities bills, thus adding utility providers to its *reach* and enabling new uses. A few months later, in September 2013, when Pingit had 1,8 million users, the app enabled functionalities that extended the *reach* to encompass small and large merchants. In this way, Pingit expanded the *reach* of its second side by gradually absorbing different types of businesses. Pingit introduced different features (*range*) in order to affiliate particular business types (sole traders vs. merchants) such as QR codes, in-app switch, buy button, etc. Thus, Pingit

partitioned the second (business) side of the platform by designing different features for each of the different business types.

6.2.3 User's Reach and Range

Despite adopting strategies to grow the number and types of the affiliated to the solution businesses, Pingit also continued to grow the size of its installed user base. In August 2012, Pingit enabled the possibility for users to send money outside UK free of charge, thereby broadening the *range* of the platform. This new feature also expanded the *reach* of the platform with new types of users, that is remittance senders and receivers. Pingit continued to introduce various new features (*range*), such as Twitter payments, easier homepage navigation, simplified registration process, as indicated by the last released app version of Pingit. Pingit also increased its *reach* on the user side by providing the solution to Windows Phone users (see Table 2).

Table 2: Overview of pingit's reach and range

Pingit			
One-Sided Platform	Side 1 (Users)	Range	P2P payments joint accounts multiple phone numbers send money abroad
		Reach	All banks customers 16-years old iOS, Android
Two-Sided Platform	Side 1 (Users)	Range	Twitter payments money remittance
		Reach	Windows Phones remittance receivers
	Side 2 (Merchants)	Range	QR Codes on bills/increase payment transaction limit <i>Pay now with Pingit</i> button in third-party apps <i>Buy it</i> button in Pingit <i>Send payment</i> button
		Reach	Sole Traders Utility companies Small merchants Insurance companies
	Interside	Range	C2B transactions B2C transactions
		Reach	Number of C2B and B2C transactions (non-disclosed)

7 Swish

Swish is a mobile payment application jointly developed by some of the largest financial institutions in Sweden (Danske Bank, Handelsbanken, Länsförsäkringar Bank, Nordea, Sparbankerna, Swedbank and SEB). The solution was introduced in 2012 and quickly became popular. Approximately every third Swede uses the mobile payment app, as the solution has more than 3,7 million registered users as of the end of 2015 [40]. Unlike the previous two payment platforms (MobilePay and Pingit), Swish has a different set up, which makes the solution an interesting case to study due to the dissimilarities between the selected solutions. Although Swish functions as one app, users need to register for the solution through their respective online banking apps offered by the participating banks. Each of the participating banks has a discretion to determine its own rules with regards to fees, payment limits, customer and merchant onboarding, age limit of customers. Despite these variations, the design and the features within the Swish app are identical to all users regardless of which bank they are customers.

7.1 Swish as One-Sided Platform

Swish, which was launched in December 2012, allows its users to execute P2P transfers in real-time by using the sender and receiver's phone numbers which are connected to their respective bank accounts [32]. Thus, Swish initially functioned as a one-sided platform, which facilitates the interactions between one distinct group of participants, namely senders and receivers of P2P payment transfers.

7.1.1 Range

Upon its launch, Swish allowed its users to send money to peers, split the bill with friends, buy second hand goods at flea markets (see Table 3). To execute a P2P transaction, a user needs to enter the phone number of the recipient, and the due amount, after which the user must enter a PIN code to finalize the transaction. In the following years, the app was improved with a couple of new releases which addressed minor user requests. In April 2013, Swish allowed non-smartphone users to receive money on their phones even though they did not have the Swish app installed. Such users, however, could not send money to their peers. Even though the functionality was limited, it allowed Swish to incorporate more constituencies to its platform, namely non-smartphone users.

Although users need to use their respective bank credentials to register for the app and the participating banks have a large discretion to determine the rules of platform affiliation, the features and functionalities are identical for all Swish users, regardless of which bank they are customers. Thus, Swish functionalities are negotiated and agreed upon by all participating banks and are released simultaneously to all users. The need for coordination among many actors makes the process of introducing new features (that is, expanding the platform's reach) more cumbersome and time-consuming. This may also pose various restrictions in the platform's ability to introduce new services on a frequent basis.

7.1.2 Reach

Swish is available only for customers of the banks participating in this payment initiative as they need to log-in through the online banking app of their respective bank. Initially, the solution was launched by the six of the largest financial institutions in Sweden, which limits the potential reach of the solution to the customers of the participating banks. In the following two years two other Swedish banks, Skandiabanken and ICA Bank, joined the Swish initiative by making the solution available to their customers. Thus, Swish's potential reach was expanded to the customer base of two other banks.

Swish users can send and receive money from all participants affiliated to the platform, regardless of their bank. This set up of the solution not only stimulates the creation and maintenance of same-side network effects between receivers and senders, which form one distinct group of participants, but also drives the adoption of the service. Swish managed to attract 420 000 active users in the first six months after its launch with the number of users amounting to 700 000 at the end of the first year after the app release (Site 3). Initially, Swish was available on iOS and Android devices. In October 2013, Swish app for Windows Phone was released (Site 3), which enabled users with such devices to gain access to the full range of Swish services. Apart from allowing users with different smart phones to join the solution, Swish's reach also expanded as to encompass non-smart phone users, to be able to receive P2P transfers.

7.2 Swish as Two-Sided Platform

After Swish managed to attract more than 1 million users, it enabled its users to send money to companies and organizations in June 2014. As Swish's user base was growing at a stable pace, it became attractive to another group of constituencies that wanted to have access to the sheer size of Swish's users. Thus, by adding a second group of participants, Swish was transformed from being a one-sided to a two-sided platform.

7.2.1 Interside Reach and Range

Approximately two years after the initial release of the Swish app, the solution enabled the execution of C2B transactions (interside range) by allowing users to pay for products and services at various small- and medium-sized merchants and to donate money to selected charities and not-for-profit organizations. To send money to merchants, users enter the merchant's number, the due amount and enter their PIN to confirm the transaction. In January 2016, Swish was enabled as a payment method in various webshops and third-party apps. To use Swish as a payment method in online check-out, users enter their phone number and the web store then sends a payment request to the users' Swish app. The users can then see the payment request with the details of the payment and enter their PIN to execute the transaction. Although each of the participating banks enable all these cross-side interactions simultaneously, each bank can design its own specific rules according to which these interactions can take place (e.g., pricing per transaction, etc.).

7.2.2 Merchants' Reach and Range

By enabling C2B transactions, Swish affiliated a second distinct group of participants to its platform. To be able to accept Swish payments, businesses need to get a Swish number, which is directly linked to the businesses' bank account (range). Users send money to merchants by using the merchants' phone number. This set-up of the solution allows for small and medium-sized businesses (reach) to accept payments. However, it is not currently possible to pay with Swish at large merchants such as supermarkets. In July 2015, approximately one year after the launch of C2B transaction functionality, 24 700 businesses were affiliated to the solution, while the number of users amounted to three million people [39]. By the end of 2015, the number of participating businesses (merchants and charities) increased to 45 000 [40], which indicates for a strong adoption rate of the solution among merchants and charity

organizations. Since January 2016, Swish users can use the solution as a payment method in online stores (reach) as well as for in-app purchases in selected third party apps that can integrate the solution by using Swish' Application Programming Interface (API) (range) [38]. As with the set up of cross-side interactions and defining the access rules of the first platform constituency (users), each of the participating banks can determine the rules for platform affiliation of the second constituency (i.e. who can access, how the process is conducted, pricing model).

7.2.3 User's Reach and Range

The sheer size of Swish's user base helped the solution to attract businesses that wanted to gain access to new potential customers. As the size of the Swish's installed user base is key competitive advantage for the solution, Swish also focused on attracting new users and locking-in its existing users. Swish has launched new versions of the app with incremental improvements. In July 2015, a new design of the Swish payment app was released, but it did not introduce new features and functionalities. Swish also aimed at expanding the reach on its user side by releasing an app version for Windows Phone' users.

Table 3: Overview of swish's reach and range

Swish			
One-Sided Platform	Side 1 (Users)	Range	P2P payments Split the bill
		Reach	Customers of participating banks iOS, Android non-smartphone users
Two-Sided Platform	Side 1 (Users)	Range	Minor app releases
		Reach	Windows Phones
	Side 2 (Merchants)	Range	Swish Merchants Number Swish API
		Reach	Small and medium companies Online shops Charities
	Interside	Range	C2B transactions
		Reach	Number of C2B transactions (non-disclosed)

8 Discussion

This paper proposes the Reach and Range Framework for multi-sided platforms as an analytical tool to address some of the main challenges that platform owners face. To this end, we have adapted Keen's Reach and Range Framework to study MSPs and synthesize some of the main strategic considerations that platform owners need to tackle at the different stages of the platform's evolution. We select three case studies (two similar and one dissimilar) to demonstrate the usefulness of the framework to guide platform owners when addressing and designing strategies for overcoming various hurdles.

We found that the key to successfully launch and manage digital payment platforms is to balance the *reach* and *range* on each of the platform's sides and across sides. Thus, a platform provider needs to design and execute strategies to grow the number of participants as well as the types and volumes of interactions on each side. It also needs to have in place a strategy that nurtures the interactions across sides. To do so, a platform provider leverages the *reach* and *range* of each of the affiliated to the platform distinct group of participants. Furthermore, as platforms evolve over time, they face various strategic challenges throughout the different stages of their evolutionary path, which necessitates that platform owners adopt specific strategies to manage the reach and range of the platform (see Table 4).

8.1 One-Sided Platforms - Building Reach, Limiting Range

The key challenges that one-sided platforms have to solve is swiftly gaining a critical mass of participants in order for a platform to secure its endurance. We argue that in order for a platform to succeed in this task, the platform owner needs to focus on the platform's reach and limit its efforts with regards to expanding the platform's range. This strategy recommendation calls for a platform owner to initially offer a limited number of features that target one distinct group of platform participants. For example, all of the three analyzed cases (MobilePay, Pingit and Swish) offered identical functionality (P2P) upon their launch that specifically targeted one distinct group, namely users. Thus, initially a platform owner should focus on achieving a sheer number of users within one main functionality and should abstain from introducing too many features that target the platform's user base (i.e., a platform should not offer too many functionalities to too many users).

Table 4: The use of reach and range framework for multi-sided platforms for strategic challenges

Platform Type	Strategic Challenge	Reach and Range Framework	Examples of Mechanisms		
			<i>MobilePay</i>	<i>Pingit</i>	<i>Swish</i>
One-Sided	Get critical mass of users	Build <i>Reach</i>	All banks' customers	All above 16-years old	All participating banks' customers
		Limit <i>Range</i>	P2P	P2P	P2P
Two-Sided	Adoption on the second group of participants	Build <i>Reach</i>	SMEs Large merchants Webshops	Sole traders Large merchants	SMEs Charities Webshops
		Diversify <i>Range</i>	NFC Bluetooth Business Online	<i>Buy It</i> button <i>Pay now with Pingit</i> button	Swish number for merchants Swish API
	User Stickiness (lock-in effects on the user base)	Strengthen User <i>Range</i>	Increase daily payment limit	Twitter payments	New app design
		Grow User <i>Reach</i>	Windows Phone app	Windows Phone app	Windows Phone app
		Enable Interside <i>Range</i>	C2B transactions	C2B transactions B2C transactions	C2B transactions
	Recurrence (high volume of cross-side transactions between the affiliated sides)	Manage Interside <i>Range</i>	Bonus	<i>Buy It</i> button	<i>Pay with Swish</i> button
		Scale <i>Reach</i> on second group of participants	Third-party apps	Insurance companies	Third-party apps

The suggestion to limit the platform's range, which we define as the platform's ability to introduce new functionalities, however, does not imply that a platform owner should not leverage the platform's reach. We stress that platform owners should focus on introducing limited number of functionalities that can further facilitate and speed up the platform adoption. For example, MobilePay modified the amount limits for daily payment transactions on several occasions, while Pingit lowered the age of its users (see Table 1 and Table 2). Thus, the two solutions concentrated on making already introduced functionalities more appealing to both existing and potential users. Platform owners can also choose to introduce features in order to extend the main functionality of the one-sided platform that constitutes its value proposition. The main value proposition of the three investigated digital payment platforms is built around executing fast and easy P2P money transfers. In order to enhance this functionality, all of the solutions introduced *split the bill* functionality, which allows for executing P2P transaction within a specific context (e.g., restaurant visit with friends). In addition to this, Pingit enabled its user to conduct international money remittances, which is another form of P2P money transfers taking place when users want to send money across borders. Thus, by enhancing and expanding the main functionality of the one-sided platform (range), the platform owner indirectly targets new potential users, thus expanding the reach on the first distinct group of participants affiliated to the platform. The key strategy which a platform owner should adopt during the first stage of platform evolution is offering limited functionalities to an increasing number of users forming one distinct group of platform participants (i.e., offering little to many).

It is interesting to note that although Swish also leveraged its platform range as described above, it adopted a slightly different approach to managing its platform *reach* due to its specific set up as a collaboration between various financial institutions. Swish's platform *reach* expanded after two more Swedish banks joined the solution when they enabled their customers to gain access to the payment solution. Thus, Swish managed to extend its platform *reach* without leveraging its platform *range*. This, however, is due to the unique platform design of the solution and it does not impact the importance of balancing both platform *reach* and *range* throughout the first phase of platform's evolution.

8.2 Two-Sided Platforms - Adopt Multiple Strategies to Tackle Multiple Challenges

As the platform affiliates with a second distinct group of participants, it becomes two-sided. This presupposes that the platform increases its complexity as it has to cater to two constituencies (the first constituency is the first affiliated group of participants, while the second constituency represents the newly affiliated second distinct group of participants) and to nurture the interactions between them. Thus, a platform owner has to tackle a series of strategic challenges.

8.3 Build Initial Reach, Diversify Range to Spur Adoption of the Second Platform Constituency

One of the main challenges which a platform owner faces at this stage is to ensure that enough participants of the newly added second constituency join and transact on the platform. Initially attracted by the size of the installed platform base, the participants of the second distinct group affiliated to the platform tend to be eager to join the platform. Regardless of this initial enthusiasm, platform owners often find that they have to further design and adopt strategies in order to increase the number of participants that form the second distinct group affiliated to the platform. Thus, when a new constituency is added, the overall reach of the platform expands, but while the reach of the first group of participants is ensured, the reach of the second constituency has to be built from scratch. To solve this conundrum and build the reach of the second platform side, a platform owner needs to diversify the range associated with this platform side.

None of the investigated solutions (MobilePay, Pingit and Swish) added a second platform constituency (i.e., businesses) as one homogenous group (or one uniform constituency). Instead, they gradually added different types of businesses as a second distinct group of participants starting by first offering solutions to small merchants, and then expanding to online retailers, large retail chains, insurance companies (see Table 1, Table 2 and Table 3). Thus, the platform reach of the second constituency scales up gradually. The three solutions also deploy separate mechanisms to target the different business types, thus diversifying the range of the second distinct group of participants. MobilePay users, for example, rely on NFC or Bluetooth technology to pay in-store to large merchants, while they use a merchant's mobile number when shopping in small retail shops. The rationale behind this set-up is based on the differences in the payment needs of large retailers that process a large volume of transactions and require fast solution at check-out. Thus, different payment options (range) have to be offered to address more appropriately the needs of the different merchant types (SMEs, large retailers, online stores, apps) (reach). Subsequently, by partitioning the business side, the digital payment platforms take into account the heterogeneity of the different actors and design specific solutions in order to get them on board.

8.4 Strengthen Initial Range, Grow Initial Reach and Enable Interside Range to Ensure User Stickiness

Even though a platform has managed to increase its *reach* (i.e., it has attracted a significant number of users, it also needs to deepen its value proposition in order to lock-in the existing participants that form the first distinct group of platform participants. In order to do so, platform providers can deploy three different mechanisms. A platform can strengthen the initial range of the first constituency by introducing new functionalities, and thus creating new types of same-side interactions that will drive user engagement. An example of this is Pingit which enabled Twitter payments to grow the *reach* of its first group of participants after it added its second constituency, i. e. businesses. It is also interesting to note that a platform owner can introduce different types of features as part of its efforts to leverage its *range*. While features such as Twitter payments and money remittances focus on accommodating various payment scenarios, features, such as adding a profile photos and photos to receipts aim at improving the user payment experience.

Platform providers should also focus on growing further the initial reach of the first platform constituency by increasing the number of the affiliated participants. As more users join the platform, the existing users will benefit from strengthening the same-side network effects as they can now transact with a larger user base, which ultimately bolsters the platform's stickiness. For example, MobilePay, Pingit and Swish launched versions of their apps for Windows Phones, thus extending the reach of their first constituency (i.e. users). Despite the growing user base and increased same-side interactions, affiliated users exhibit low levels of engagement as P2P payment transactions usually occur on a sporadic basis (e.g., most people do not transfer money to their friends on a daily basis, but just on a couple of occasions). To solve this, MobilePay, Pingit and Swish enabled C2B interactions by allowing people to use their apps in various other contexts, thus enabling new uses and increasing the value of the platform to the first platform constituency.

8.5 Manage Interside Range and Scale Reach on Second Side to Create Platform Recurrence

Apart from tackling issues with regards to the adoption of the second platform constituency and ensuring stickiness of the initial user base, a platform owner needs to design and enable reoccurring interactions between the two distinct groups of participants that are now affiliated to the platform. A platform owner needs to introduce new functionalities which enable the interaction between the platform sides, thus creating platform interside range. For example, MobilePay, Pingit and Swish allowed its users to execute C2B transactions. By enabling cross-side functionality, a platform could unlock new uses for its app and expand its overall *reach*. The establishment of Interside range increases the complexity of the overall platform's range as the platform owner needs to maintain and drive the adoption all of the existing functionalities, while at the same time spurring the adoption of the new features. The successful introduction of new functionalities requires the platform owner to gain a critical mass of users who adopt such cross-side interactions. Thus, platform interside reach indicates the number of users who actively use the new feature (in our cases, the number of users who adopt C2B transactions (Interside range), which differs from the adoption of P2P transactions, which refer to platform initial range of the first constituency. Platform Recurrence, which we define as the achievement of high volume of transactions between the two affiliated to the platform distinct group of participants, is also dependent upon the ability of the platform owner to scale the reach of the second constituency. As more merchants adopt Swish and the solution becomes widely accepted, more users are likely to use it in order to pay for their goods. Thus, the expansion of the *reach* of a platform's side can also facilitate the adoption of the interside platform reach.

As all of the three analyzed cases (MobilePay, Pingit and Swish) function as two-sided platforms, we are not able to investigate the usefulness of the Reach and Range framework for solving some of the strategic challenges that multi-sided platforms face. In section 3.1, we identified platform variety and platform defence as the main issues that multi-sided platforms have to tackle, but we are not able to test these assumptions further due to lack of data.

To further demonstrate the usefulness of the Reach and Range Framework as a tool to overcome the main strategic challenges that a platform faces throughout its evolution, we applied the framework to explain the failure of two solutions that are considered to be competitors to two of our selected cases.

Approximately nine months after the release of MobilePay in Denmark, the online payment solution, Paii, was launched by 4T, a joint venture between all four major telecommunication operators in the Danish market [35]. The account-based solution enables users to make web and app purchases, transfer money to other Paii user's or pay via SMS without it showing up on their phone bill. Less than a year after its launch, Paii was discontinued and sold out to one of its competitors on the Danish digital payment market, Swipp. Paii was launched as a two-sided platform as it was trying to attract both users and merchants on board simultaneously. As a result of its initial platform design, Paii had to tackle multiple challenges. The solution had to achieve reach on both platform constituencies (users and merchants), while trying to create and manage interside reach and range (C2B transactions) (see Table 4). Paii also started by designing and offering wide platform range on the user side (one of the two platform constituencies), as it enabled its users to execute both P2P and C2B transactions (unlike the first strategy we have identified (see Table 4)). This presupposes that a platform owner has to achieve reach for both features, thus creating sufficient same-side network effects for the adoption of P2P functionality (platform's reach on one distinct group of participants, namely, users (see Figure 1)) and cross-side network effects for the adoption of the C2B functionality (platform's interside reach (see Figure 2)). Another major hurdle was that Paii managed to ensure only limited reach on the merchant side, which limited the number of potential cross-side interactions and reflected negatively on the platform interside reach. At the same time Paii, whose main target were online merchants, failed to diversify the range on the merchant side (i.e. offering different functionalities for different merchants), which impacted on the number of merchants joining the platform (reach). The merchant's reach was also hindered by the limited reach of the other distinct group of participants on the Paii platform, namely the users. Thus, one of the main mistakes that Paii made was trying to offer a wide variety of functionalities to more than one group of platform participants at an early stage of the platform's evolutionary path (i.e., being too much to too many too soon).

The same analysis can be applied to investigating the reasons behind the failure of Bart, a Swedish mobile payment solution offered by Swedbank, which was discarded in 2014 [15]. Bart is another example of a two-sided platform which tried to get two distinct groups of participants on board simultaneously. The account-based solution made use of QR codes to execute C2B in-store transactions and required merchants to be equipped with QR-readers. Bart managed to sign on one big retailer chain (Axfood) to use the service [4]. However, it failed to attract other major retailers, as its fees, which were the same as paying with cards, were higher than the fees offered by other payment services in Sweden. The interest from the consumer side was also very low with just 20 000 users signing up for the service [2]. As a result, the service was scrapped and Swedbank joined the Swish initiative. Bart failed to achieve a sufficient number of participants on both of its sides, as it mismanaged the platform's reach and range. The solution was available only to the customers of Swedbank, significantly limiting the platform's reach on the user side. Bart's platform reach on the user side was low, as the solution did not support any features that spurred users' adoption of the payment app such as P2P transactions. The platform's reach on the user side depended directly on the platform's reach on the merchants' side (that is, the number of merchants joining the platform). Thus, Bart was

focusing on creating and managing interside platform reach by stimulating cross-side interactions. However, the platform's reach on the merchant side, which constituted the second platform constituency, was inhibited due to the lack of critical mass of users. Bart also tried to attract merchants by offering only one type of solution to businesses (QR code scanning). Thus, the solution failed to diversify its platform reach in order to appeal to wider types of merchants (see Table 4). Under the Reach and Range Framework for MSPs Bart's failure can be attributed to offering limited cross-side functionality such as C2B transactions (interside range) the adoption of which is subjected to the presence of strong platform's reach on each of the platform constituencies between which the cross-side interactions take place (i.e. being too little to too few as Bart could not manage to attract enough users and merchants).

The findings of this research further expand the literature on entry and expansion strategies for MSPs. As discussed in Section 2, a couple of researchers have proposed stage models to guide the launch and subsequent evolution of MSPs. The models, however, only partially address some of the challenges which platform owners face throughout the platform's evolution, and thus they do not prescribe in-depth strategic recommendations in order to guarantee the platform's success.

Evans [11], for example, proposes a two-stage model to explain the market entry and growth of MSPs (ignition-growth model). According to him, the success of a platform depends on the ability of the MSPs to reach critical mass, that is, the number of users on both sides has to reach a certain point. To this end, Evans [11] recommends a zig-zag strategy, where a platform launches with a limited number of participants on both sides and grows over time. Evans' model, which presupposes that a platform is launched and managed as two-sided, does not take into account the different platform design possibilities upon entry (one-sided or two-sided) and the fact that different platform designs require different strategies. The platform evolution under Evans [11] is solely associated with changes in the number of platform participants and does not take into account other important elements of platform evolution such as the introduction of new features. Furthermore, the zig-zag strategy proposed by Evans only gives recommendations with regards to managing the number of participants on both sides affiliated to the platform. Thus, the model does not address one-sided platforms and how they can be transformed into being two-sided. In contrast to Evans' model [11], the Reach and Range framework for MSPs helps us view the platform evolution as a complex process that includes not only the attraction of a huge number of users (reach), but also the introduction of new features and functionalities (range) that serve a double purpose: first, to attract more users (reach), and second, to increase the platform stickiness in order to lock-in the already attracted users. Thus, we argue that there is an interdependency between *reach* and *range*, and in particular that the increase in platform *range* can lead to the increase of platform *reach*. Unlike Evans' model, we also recognize that a platform faces various strategic challenges throughout the different stages of its evolution (see section 3.1.).

Hagiu's model [19] recognizes the gradual transition of a platform from one-sided to being two-sided and prescribes mechanisms (platform's breadth and depth) that a platform owner can leverage during this process. The Reach and Range framework for MSPs is anchored around the concepts of reach and range, which have some similarities and dissimilarities with the notions of breadth and depth. Although both sets of concepts focus on the number of participants as well as on the features and functionalities offered by a platform owner, Hagiu's depth and breadth are applied on a general platform level and do not address in details the interplay between the two concepts. For example, the notion of breadth implies adding separate constituencies (that is separate platform sides) and does not take into account the fact that the size of a particular platform side also grows over time (its reach). Hagiu's platform breadth comprises the number of the affiliated to the platform groups of participants (sides), while our notion of platform *reach* is associated with the size of a particular platform side and also with the interside reach, which measures the size of the interactions across platform sides. Although Hagiu's concepts of breadth and depth are important for the platform's evolution, we further extend these concepts by applying them on a more detailed level, which allows us to pinpoint the various interdependencies between the platform's reach and range. Furthermore, Hagiu's model [19] is based on a single strategy which a platform owner can adopt in its expansion quest. Hagiu recommends that before a platform adds an additional platform constituency (that is, it expands its breadth), a platform owner should offer new functionalities so to increase the platform depth. This is a valid strategy that is also part of the strategies we prescribe for successful platform expansion (see Discussion). The adoption of the Reach and Range framework for MSPs, however, allows us to deduct multiple strategies and strategic recommendations for how to leverage the platform's reach and range (see Table 4), which can guide more precisely the platform owners' efforts to spur the platform adoption.

The Reach and Range framework for MSPs differs from the already existing models in the MSPs literature, as it recognizes the different strategic challenges that a platform owner needs to tackle throughout the platform evolution. Further, it provides the needed mechanisms (leveraging the reach and range) in order to address them (see Table 4). Such considerations are absent from Hagui's model [19], and while Evans [11] recognizes the importance of achieving critical mass of users, he does not provide more examples of present or future strategic challenges and how his model can help overcome them. Although Tiwana [42] recognizes the fact that platforms face different strategic challenges throughout the different stages of platform evolution, his work lists only some of them in the form of evolutionary metrics and does not offer a model that contains prescriptions of how to tackle them.

Although we recognize that the above mentioned models present important and relevant findings, we argue that they address only partial issues and do not provide coherent strategic recommendations to guide platform owners.

Nonetheless, we draw upon some of the main assumptions of the three models (Evans' notion of critical mass as important threshold for platform's evolution [11], Hagiu's concept of depth and breadth as mechanisms for leveraging the platform's adoption [19] and Tiwana's notion of evolutionary metrics as foundation for determining some of the strategic challenges faced by platforms [42]) in order to apply MSPs logic to the Keen's Reach and Range Framework. Thus, we design the Reach and Range framework for MSP as an analytical tool that provides in-depth understanding of the platform's key mechanisms (reach and range) and how they can be leveraged to address the main strategic challenges that a platform owner faces during platform evolution.

9 Conclusion

The aim of this paper is to identify successful strategies to which mobile payment platforms can adhere in order to ensure their initial and subsequent adoption. To this end, we investigate the applicability of the Reach and Range Framework for MPSs for overcoming some of the main challenges associated with platform adoption and use this analysis to deduct strategies for successful platform entry and expansion. In order to do so, we first apply the framework to study three successful mobile payment platforms. After analyzing the selected cases, we prescribe several strategic recommendations that can assist platform owners in their quest to spur platform adoption. We further prove the explanatory power of the framework by illustrating its usefulness for explaining the failure of two mobile payment solutions. Our main finding is that successful mobile payment platforms tend to follow a particular evolutionary path that ensures a high adoption rate among the platform participants. We, thus, recommend that a mobile payment solution should be launched as a one-sided platform in order to attract a sufficient number of users, and then gradually expand into being two (multi)- sided by adding more platform constituencies. The key to successfully managing this transformation is determined by the platform owner's ability to leverage a platform's *reach* (number of participants) and *range* (features and functionalities).

The contributions of this paper are several. First, we conceptualize a framework that can serve as a useful vehicle for understanding and mapping out a platform's evolution. Second, we demonstrate the usefulness of the Reach and Range Framework for MPSs to address key issues with regards to platform adoption. Third, we identify several strategic recommendations for leveraging the platform's reach and range that a platform owner can consult when tackling the various strategic hurdles at different stages of platform evolution. Fourth, although we apply the framework to the cases of digital payment platforms, we demonstrate that the Reach and Range Framework can be used to guide the strategic planning of every business functioning as a platform. Finally, the proposed framework as well as the identified strategies that a platform owner can adopt in leveraging the platform's reach and range can serve as a useful guide for practitioners when designing and executing platform entry and expansion strategies.

We limit our analysis to investigating only a few strategic considerations that platform owners face. In reality, a platform owner has to address strategic issues such as platform governance, platform pricing and designing a viable business model, developing a platform-based ecosystem, etc. In our analysis, we also rely predominantly on secondary data (with the exception of MobilePay where we had access to primary data), which constitutes another limitation of this paper. Although the gathered data is representative enough, the analysis could be further extended by delving into further details, which can come from primary data. Future research may pinpoint how the Reach and Range Framework relates to broader topics such as platform governance, platform pricing and platform-based ecosystems. The framework can also be applied to MSPs other than digital payments.

Websites List

Site 1: MobilePay App

<http://www.mobilepay.dk/da-dk/Pages/mobilepay.aspx>

Site 2: Pingit Website

<https://www.pingit.com/#/>

Site 3: Swish Official Facebook Page

<https://www.facebook.com/getswish/>

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