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A Model of Digital Payment Infrastructure Formation and Development Under an Emerging SEPA Regime: The EU Regulator´s Perspective

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Abstract

The Single Euro Payments Area (SEPA) is probably the most ambitious self-regulatory project aimed at creating a single integrated European digital payments market since the introduction of the Euro. SEPA aims to make EU more innovative and competitive. When considering the SEPA initiative and combining it with the disruptive and innovative nature the mobile phone permeates, the result is a market that is rapidly transforming from well-established into a state of flux. We build a model to understand and explain this transformation of the digital payment infrastructure. The model captures the formation and development of digital payment infrastructure with a particular emphasis on the regulator´s perspective. It consists of four stages characterized by slow incremental change following by short rapid bursts of discontinuity. Each stage is portrayed by its evolutionary dynamics, the nature of the payment platform, the legal implications, the regulatory asymmetry, the level of competition, and what drives the discontinuity.

Keywords: EU, digital payments, SEPA, multi-sided platform, evolutionary economics, institutional isomorphism, regulation

1. INTRODUCTION

The Single Euro Payments Area (SEPA) is probably the most ambitious self-regulatory project aimed at creating an integrated European digital payments market since the introduction of the Euro (Allix et al., 2009). The SEPA vision was set out by EU governments in the Lisbon Agenda (2000), which aims to make the EU innovative and competitive. Yet it has not received much attention by the few researchers in the digital payment area.

The starting point for the SEPA project can be traced back to the adoption of Regulation 2560/2001 on cross-border payments in Euro which introduced the principle of equal charges for cross-border and domestic payments. But the regulation itself was not sufficient to accomplish EU payment market integration. Instead the regulation was a clear signal to the banking industry to fill this apparent void by introducing technical standards (Janczuk-Gorywoda, 2012).

Simultaneously with the SEPA regulation process the mobile phone is demolishing well established business models and associated institutions while paving the way for new. The mobile phone is gradually eroding hard earned concessions and absorbing services that previously were profitable. For example consider that the mobile phone is in the midst of absorbing navigation devices (GPS), mp3 players, and cameras as separate physical objects. The annexation quest of the mobile phone propels forward and it has already set its target on digital payment (e.g. Google Wallet, iZettle etc.).

Currently, domestic payment arenas are well established with predefined roles and profitable business models. However, there is little doubt that the mobile phone under the auspices of SEPA and the EU regulatory initiatives is going to upset this equilibrium by transforming the payment market. So when the SEPA changes in the regulatory environment are combined with the apparent disruptive nature of the mobile phone the result is a digital payment market that is rapidly transforming from well-established into a state of flux. Consequently, in this paper we seek to provide an answer to the following eminent research questions facing the payment industry today.

How to understand and describe the formation and development of digital payment infrastructure from innovator's and regulator's perspective?

We present our answer as a framework that captures and portrays the formation and evolution of digital payment infrastructures. This paper proceeds as follows. In section 2 we present our theoretical basis. In section 3 we conceptualize our model. In section 4 we discuss the model and its limitations and make some conclusions.

2. THEORETICAL FOUNDATIONS

Our theoretical framework builds upon several different fields of enquiry. We adopt an interdisciplinary approach in order to gain an in-depth understanding of the evolution of the digital payment market. We analyze the payment systems as multi-sided platforms which main goal is to mediate the interaction between several groups of actors. The evolutionary theory helps us explain the dynamic of the development and how the different entities move from one stage to the next. The legal theory we use sets the rules of the competition and shapes the environment in which the different actors co-exist and contest.

Regulation is hard to define (Levi-Faur, 2011). Some understand regulation as rules and function of administrative agencies after the act of deregulation, for other regulation is every kind of rule, including primary regulation, secondary legislation and even social and professional norms. Adopting the categorization of Julia Black who distinguishes between functionalist, essentialist and conventionalists definitions of regulation, this paper follows a functionalist definition which is based on the function that regulation performs in society, or what it does (Black, 2002). Therefore our

understanding of regulation is strictly connected to the achieved effect (goal), i.e. regulatory symmetry or asymmetry.

2.1. PAYMENT INFRASTRUCTURE BACKGROUND

In 2002 banks and banking associations established the European Payment Council (EPC) as a decision-making body of the European banking industry with the main purpose to support and promote SEPA. The EPC develops payment schemes (SEPA credit transfer (2008) and SEPA direct debit (2009)) and frameworks (SEPA Cards) which help realise the integrated euro payments market. The primary role of the ECP is to develop technical standards and business rules for the SEPA payment schemes and frameworks which can be found in the SEPA Rulebooks - a multilateral contract which have binding force between payments service providers and between the providers and the ECP. The SEPA Rulebooks, which main aim is to achieve inter-operability for cross-border payments, bear the main characteristics of a self-regulatory instrument. Introducing open, non-proprietary, and independent technical standards for an integrated payment area would generate unprecedented levels of competition. With the open standards it becomes easier for customers to switch banks. Customers can also reach other bank accounts in the SEPA using only one bank account.

The full implementation of SEPA however, is impeded by the delayed migration efforts by market players on both the demand and the supply side as they have struggled to find sustainable business case. This led to the introduction of the EU Regulation No 260/2012, which establishes technical and business requirements for credit transfers and direct debits in euro, and also defines the deadlines for the full migration to the SEPA instruments. The SEPA Regulation also introduces a notable change in the European Commission's strategy to achieve full integration of the payment markets as SEPA is no longer viewed as a voluntarily initiative, but rather as a direct regulatory requirement.

2.2 MULTI-SIDED PLATFORMS

A payments system functions as two-sided markets. There is a string of papers which consider the payment cards as two-sided platforms that enable the interaction between both merchants and consumers (Rochet and Tirole, 2002; Rochet 2006; Evans and Schmalensee, 2007). Thus payment platforms show the typical characteristics of two-sided markets, namely network externalities, multi-homing costs, "getting both sides on the board", and specific strategies to charge each group with the right price.

Network externalities make larger networks more attractive than small ones (Shapiro and Varian, 1999). For a particular technology gain momentum a critical mass needs to be achieved. Economists define the critical mass as the size of a network which has to be reached before a virtuous self-enforcing spiral can be achieved (Economides and Himmelberg, 1995). The critical mass influences market dynamics radically. Markets may grow slowly until reaching a critical mass, then, suddenly, begin expanding rapidly (Osterberg and Thomson, 1998).

The literature has not yet come up with one common definition of multi-sided platforms. Some scholars define multi-sided platform as an organization that creates value primarily by enabling direct interactions between two (or more) distinct types of affiliated customers (Hagiu and Wright, 2011). This definition allows a categorization of American Express, E-Bay and the iPhone as multi-sided platforms, but excludes department stores, video game arcades, and movie theaters. Others point out that multi-sided platforms create value by bringing two or more different types of economic agents together and facilitating interactions between them that make all agents better off (Evans, 2013).

Platform providers can enter new markets by relying either on Schumpeterian innovation i.e. being creative and out-competing the old existing system. Or they can enter launching an envelopment attack against the incumbents by offering same functionality and bundling it with their existing

products (Kazan and Damsgaard, 2013). This paper identifies an additional method which facilitates the entrance of new players into a regulated market. The intensifying competition between different payment providers leads to regulator's intervention in order to achieve level playing field for all market participants. Thus incumbents (namely banks) are forced to open up (unbundle) their infrastructure and guarantee access to the new entrants. The concept of unbundling access draws upon access to telecommunication networks where incumbent telecoms operators are forced to make its local copper-based network available to other companies through a strict regulatory process (Nardotto et al., 2013).

2.3. EVOLUTIONARY ECONOMICS

To capture the dynamics of competing technologies we adopt evolutionary economics which tries to explain the nature of the economic change. The evolutionary economics is based on the variation, selection and retention mode of evolution (Aldrich and Ruef, 2006; Metcalfe, 1998). The principle of evolution states that some entities due to their specific characteristic are better adapted to evolutionary pressure than others. Variety is generated, and then the number of entities in the variety is decreased by a selection process (Mayr, 1982). Relation between variation and selection is two-way; variety drives selection and the development of variety is shaped by the process of selection (Metcalfe, 1994).

The concept of punctuated equilibrium stems from the evolutionary theory. It is largely understood that the evolution of species can occur either as gradualism or as punctuated equilibrium. Change in gradualism is slow-paced, whereas in punctuated equilibrium, change comes in spurts, often unexpectedly. Periods of very little change (or incremental change) are followed by few huge changes. The concept of punctuated equilibrium is found to be particularly useful for explaining the dynamics of technological change (Tushman and Rosenkopf, 1992; Tushman and Anderson, 1986). Technology development is presented as an evolutionary process punctuated by rapid discontinuous change.

We clearly observe the phenomenon of existing technologies being used in new application domain (in this case digital payments). To explain this we adopt the biological notion of speciation, which states that new species evolve when they are isolated from their antecedent population. The analogue of speciation in technological development is the application of existing technologies to a new domain of application (Levinthal, 1998; Adner and Levinthal, 2002). Thus we attribute the technological discontinuities to re-application of existing technologies in new application domain.

The main principles of the evolutionary theory (variation, selection, retention) are applied to the Tushman – Rosenkopf cyclical model of technological change (Tushman and Rosenkopf, 1992). The model, which is built upon the punctuated equilibrium theory, has four components: technological discontinuities, eras of ferment, dominant designs and eras of incremental change. Although we use this model as a basis for developing our model, we introduce some modifications to it.

The Tushman – Rosenkopf model stipulates that a period of change begins with the introduction of technological discontinuities. Technological discontinuities are defined as rare, unpredictable inventions which advance a relevant technological frontier and which involve fundamentally different product or process design (Anderson and Tushman, 1990). In the area of digital payments it is hard to attribute the change to rare and unpredictable innovations which result in radical advancement in the technology. The technologies which allow the execution of digital payments (e.g. NFC, QR codes, etc.) at first were developed and applied to markets other than the payment market. Later, they were adopted by the digital payment field but even though they were subjected to some adaptations, we do not witness a significant, radical modification of these technologies. Therefore, we cannot attribute the technological discontinuities to the development of the technology itself.

In this paper we rely on the evolutionary perspective on dominant designs which focuses on rivalry

among alternatives. We adopt the concept of the dominant design as a product's design specifications (consisting of a single or a complement of design features) which define the product category's architecture (Christensen et al., 1998). The introduction of new technologies leads to a rapid spread of different new designs which co-exist and enter into direct rivalry with old designs. Over the time a dominant design emerges.

2.4. INSTITUTIONAL ISOMORPHISM

This paper adopts the theory on institutional isomorphism which is anchored around the theory of technology change. Disruption technologies result in the formation of diverse set of organizations. The diversity of the organizational forms is isomorphic to the diversity of the environments (Hawley, 1968). Diverse environment nurtures diverse forms of organizations. As the diversity in the environment diminishes, a specific uniformity in the forms emerges. The concept that best captures the process of homogenization is institutional isomorphism (DiMaggio and Powel, 1983). Institutional isomorphic change, which focuses on the interaction between the different populations of organization competing for resources and legitimacy, is mainly attributed to three processes: coercive isomorphism, mimetic isomorphism and normative isomorphism (DiMaggio and Powel, 1983). The coercive isomorphism resulted from both internal and external pressures exerted on organizations from other organizations (including regulators). In this paper we argue that regulations shape the environment by exerting coercive pressure on it and pushing it towards harmonization.

The coercive isomorphism serves as a theoretical basis for the construction of our regulatory framework which tries to explain the development of the digital payment platforms from regulatory perspective. The existence of legal pressure (introduction of different legal acts, in particular directives and regulations in the EU) modifies the environment in which organizations operate. We argue that the level of legal pressure increases over the time as the digital platforms evolve.

3. CRAFTING THE DPIE MODEL

Following the evolution of the e-payment infrastructure as a two-sided market, we designed a model which introduces the regulator's perspective. Our starting point is the perception that regulation addressing emergent technologies is reactive and thus, always a step behind the development of the technology in the market. Digital payment is a relatively nascent area of regulatory activities.

The framework has two determinants: level of legal pressure and response of the organizations to the environment change. The legal pressure is connected to the regulatory asymmetry/symmetry. The higher the level of regulatory asymmetry is, the lower the level of the legal pressure is. The response to the environment change is proportionate to the level of institutional isomorphism. The more uniform the response is, the higher the level of institutional isomorphism is.

The framework is based on the assumption that more control-and-command (or more regulation) after the invention phase will lead to higher level of regulatory symmetry. Regulatory symmetry is at the core of ensuring level playing field for all the actors operating in the digital payment market. Regulatory symmetry provides incumbents and new entrants alike with a level playing field on which to compete: same price signals, same restrictions, same obligations (Schankerman, 1996). The invention phase is characterized by high level of regulatory asymmetry as opposed to the last phase where a significant level of regulatory symmetry is established**.** In this paper we assume Schankerman's position that asymmetry does not itself require asymmetric regulation (Schankerman, 1996). Rather we claim that the asymmetry stems from the different legal requirements that incumbents and new entrants face.

Under command and control regulation (CAC), the regulators fix standards on certain activities (the command) and uses legalisation to prohibit the behaviour of the regulated entities which do not conform to these standards (the control) (Baldwin, 1997; Black, 2002). There is a consensus among

different scholars that the Command-and-Control approach is inapplicable to the new paradigm created by disruptive technologies as it may stifle innovation with unnecessary compliance burden. Today, the regulation of emerging technologies is taking place in the 'era of governance' (Dorbeck-Jung, 2011). In this paper we assume that Command-and-Control regulation is the opposite of self-regulation, co-regulation and soft law. Thus, we adopt the approach followed by Linda Senden who distinguishes between traditional and new mode of governance following the ongoing debate about the emerging alternative legal forms of governance on EU level (Senden, 2005).

Next we present our model that captures and explains the different phases of infrastructure development. The model consists of four stages of long gradual change interrupted by short transitions of rapid and discontinuous change.

3.1. PHASE 1: INVENTION

The invention stage is a period of inventing new technologies or processes. Sometimes this is done without a specific application in mind or the invention turns out not to be useful for which it was first intended. Many technologies therefore can be characterized as dormant, they have been invented and maybe patented but after a few trials it is decided not to continue the development. There are numerous examples of this. For example the ATM which was created in 1939 by Luther Simijan. After six months of trails the bank reported that there was no need or demand for such a product (Barwise at al., 2011). It was not until almost thirty years later, a second attempt to popularize the ATM was made and this time the invention became widespread. The genesis of the ATM shows common characteristics of inventions as many are invented long before they become widespread. This is particularly true for the many inventions that rely on widespread adoption and (de)regulation to be firmly established.

In this first phase we have two main stakeholders - incumbents and new entrants (e.g. start-ups employing new technologies). There are established payment solutions offered by regulated financial institutions (mainly credit institutions). Most of the customers are locked-in the old payment systems. The new entrants offer either better alternative solutions or completely new payment solutions. The customers, however, are still not locked-in. As a result regulators have no clear mandate to legislate because the new technology may not lift–up. It is deemed that the threat posed by the new entrants is negligible**.**

We define this phase as a regulatory gap which is characterized by high level of regulatory asymmetry. The asymmetry is further enhanced by the different levels of competitive advantages that both incumbents and new entrants enjoy. The incumbent credit institutions have larger consumer base, access to established payment network, trust, lawyers and resources etc. which give them a significant competitive advantage over the new emerging players.

The new payment service providers have a distinct competitive advantage over regulated financial intermediaries as they are not being subject to the regulatory burdens that the incumbents face. However, they also face high level of regulatory uncertainty since they do not know what approach the regulator might take it the future. Therefore there is a high risk that the gained competitive advantage may be neutralized by too rigorous regulation introduced at a later stage.

At this stage where many uncertainties are present, regulatory asymmetry is not considered as entirely negative characteristic of the invention stage. We argue that the role of the regulator is to find the right balance between ensuring innovation and guaranteeing fair competition. Furthermore, regulation can be seen as a barrier to entry if the compliance is too high and costly.

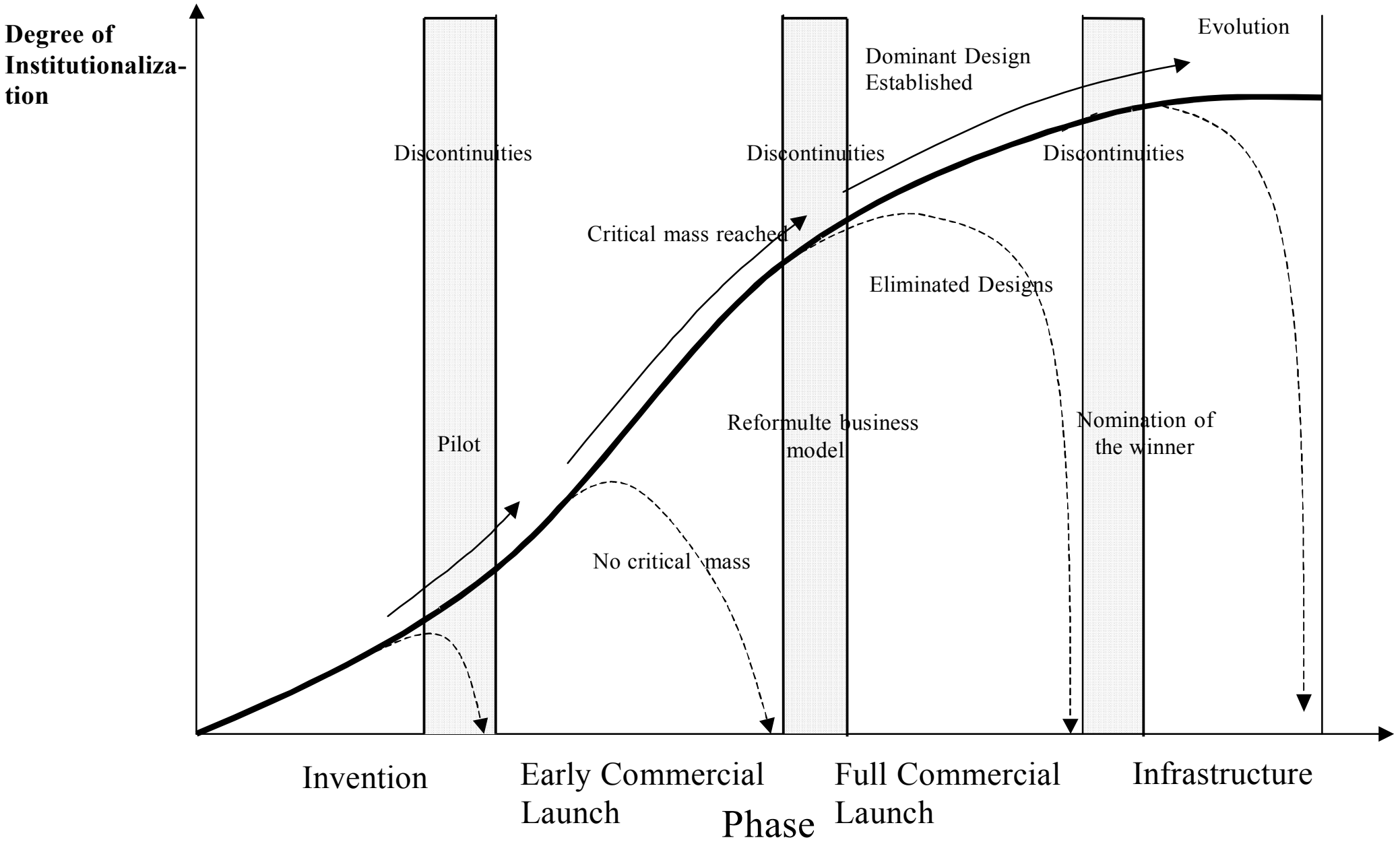

Figure 1: *Digital Payment Infrastructure Evolution*

The technology development may be observed before or after the shift of the application domain, but the discontinuity stems from the shift itself. We argue that the shift is caused when a specific technology manages to get the attention from institutional actors. *An invention, which is applied to a specific niche market, is picked up by institutional actor or a company who applies it in other niche*. This speciation usually results when a technology is taken from one niche and put into another market niche. An example of this is the wireless telegraphy which was developed to serve remote locations such as lighthouses and ships, but later it entered a subsequent niche of the long-distance transoceanic service (Levinthal, 1998). The new technology then has an evolutionary path of its own and can soon penetrate an existing mass market. This, however, happens at a later stage. First the technology has to exit the originating niche. Niches are seen as incubator rooms where the innovation can evolve protected from the mainstream market selections (Hjelholt and Damsgaard, 2013). The institutional actors select the particular invention due to the belief that it can support or enhance their position and increase their power. After applying the invention in a new niche, the institutional actor can develop the technology further or to introduce other improvements before subjecting it to the market selection. To exit the niche an institutional actor has to test the market potential of the selected technology. Thus the niche innovation is offered as a service in the market often on a trial basis. After such pilot is completed, the institutional actor evaluates the results and decided whether to launch the innovation or not in the next stage – early commercial launch. Thus the exit of the niche depends on the result from the pilot.

The observance of pilot (or trial) in the digital payment framework brings up for discussion an important question. Examples, in particular from the mobile payment services market (Ondurs et al., 2009), show that many mobile payment services solutions offered as a services in the market on a trial basis often fail due to a lack of institutional support from all key players (Dahlberg et al., 2008). Many factors are at play here, and we do not try to simplify the process, but we may assume that the presence of institutional support in the pilot stage is of critical importance for the final success. Then one obvious question appears - is the institutional support in the pilot stage a form of selection? The short answer is negative. We claim that variation is triggered by the institutional actor or a company who decides to shift a specific technology or innovation to a new domain of application. Later this technology or innovation is piloted, and then the success of the pilot is attributed to a certain level of approval from the same or another institutional actor. The real selection happens in the market field.

3.2. PHASE 2: EARLY COMMERCIAL LAUNCH

The second stage is characterized by the first commercial launch of the service. At the stage most digital payment solutions are offered as a single standalone payment instruments or APPs. Therefore the digital payment systems bear the main characteristics of a simple two-sided market. An example for this is the payment cards which need to attract both merchants and cardholders to create cross-side network effects (Rochet and Tirole, 2002).

The speciation of various technologies to the payment industry during the previous stage leads to variation in the offerings (Tushman and Rosenkopf, 1992). Variation is defined as a change from current routines or competencies like founding of new organizations by outsiders of the industry (Aldrich and Ruef, 2006). We claim that variation begins after a company decides to shift a specific technology or innovation to a new domain of application and offer it commercially. This act spurs variation in the new niche. These innovations lead to the emergence of many new entities which enter into an environment previously inhabited only by incumbents and thus giving rise to specific variation. It is important to note here that in the digital payment area the variation comes from the various existing technologies re-applied to this market from other domains (NFC, QR, card readers), as well as from the institutional actor who choose them (e.g. many new entrants offer NFC-based payment solutions in various forms). Therefore, we argue that the variation in the digital payment market is two-folded. Thus the variation stage is characterized by new entrants and their co-existence with other new entrants and with the incumbents who inhibited the niche before (e.g. the plastic card).

The number of the new entrants is usually growing faster and the interaction with the other actors in the environment (new entrants and incumbents alike) is chaotic.

We conclude that the variation stems from the technological discontinuities and continues throughout the whole phase of the early commercial launch. Variation is put to selection, or to forces which significantly reduce the number of entities, in the mainstream market which is characterized by a severe competition. We recognize that competition forces are present in the phase of early commercial launch, but their severity is limited as the market is still nascent.

The main objective of this stage is to attract users and let them try out the new product/service. A popular way to attract first-time visitors is to offer gifts, subsidies or discounts (Damsgaard, 2002). Most of the emerging digital payments solutions offer their services for free as part of their freemium business model in an attempt to attract as many customers as possible. The critical mass concept has very important implications for the competition in the digital payment markets and hence regulation. Being able to achieve a critical mass is the threshold for the adoption of a new technology or a payment service. If a critical mass is not reached, the specific payment solution just dies out.

Unlike the cyclical model of technological change proposed by Tushman and Rosenkoph, we claim that the variation stage is characterized by a certain degree of inertia before the selection begins. The variation may be initiated by the technological discontinuities, but after this there is a period of intensive reorganization within the variation. The reorganization is needed as a form of preparation and resource allocation before the selection phase. This claim is consistent with the findings of Metcalfe, who argues that there is an element of inertia which holds the competing varieties in a stable form for long enough for selection to change their relative importance (Metcalfe, 1998). At this stage entities respond quite differently to the imposed environment pressure.

Since the regulator does not have a clear mandate to legislate after the introduction of new technologies, the new entrants are left operating in a legal void without clear guidance to adhere to. As a response to this many industry players form self-regulatory bodies which develop a common set of standards and business rules applicable to all of its members. The main goal is to gain a cohesive voice in the industry and to seek membership with influential bodies which can shape policy-making decisions.

SEPA was started as a political initiative which would lead to the integration of the European Payment market, and as such it has distinctive political drivers - EU governments, the European parliament, the European Commission and the European Central Bank. However, the execution/implementation of SEPA was entrusted to a self-regulatory body, namely the European Payment Council. We argue that at this stage SEPA has all the characteristics of a typical self-regulation initiative.

Although self-regulation can be seen as a step towards regulatory symmetry as it tries to fill the regulatory void, the levels of asymmetry still remain high. We attribute this to the voluntarily nature of the self-regulation which in contrast to regulation does not have binding force. Therefore, the decision to join or not a particular regulatory initiative remains mainly with the companies themselves. The asymmetry is also attributed to the uncertain future of the new payment technologies and payment services. Until the new technology reaches a critical mass, the levels of competition remain low and there is no particular need to regulate it. Before passing the critical mass test the future of the new payment services seems unstable and insecure. Therefore, the traditional, hierarchical Command-and-control regulation is still not favored at this stage, but rather alternative instruments are preferred. This conclusion is aligned with the existing discussion about the traditional regulation and the emerging new modes of governance.

The successful transition from the early commercial launch phase to the next stage of full commercial launch is achieved with the radical change to the business model to make it viable. During the present

stage companies managed to attract more users and to establish a growing user base but the business model was aimed at attracting users and not making a profit. The full commercial launch phase, however, is characterized by intensified competition between many platforms each with its own well defined user base. As the environment, which companies operate in, has changed, it is expected that companies should also change their business models to prepare for the selection phase.

3.3. PHASE 3: COMMERCIAL LAUNCH

In the commercial launch phase payment instruments converge and transform from two-sided into multi-sided platforms. Payment cards are transforming from a single-purpose card to a multi-functional card either enveloping or being enveloped. For example through the use of NFC technology which is capable of hosting several other contactless applications (e.g. ticketing or loyalty) (Kazan and Damsgaard, 2013). At this stage we witness the formation of new platform- based designs which co-exist with the old designs. As an example of what we called old payment design are the single payment instruments such as the plastic card. On the other hand, there is a proliferation of new, more complex designs such as the digital payment platform design (Kazan and Damsgaard, 2013). This framework consists of three elements – platform design, technology design and business design and defines the digital payment platforms as multi-sided platforms where a payment platform in conjunction with physical proxy can host a complimentary application and enter into new markets.
Commercial launch phase is characterized by intensive competition between incumbents and new entrants as well as between new entrants themselves. Different payment solutions fight to become the dominant actor in the market. Often solutions will be in direct competition over the same users or costumer (Hjelholt and Damsgaard, 2013). A particular solution will at this point be in constant battles with other solutions promoted by actors with other interests (Shapiro and Varian, 1999).

From evolutionary economics perspective, while innovation is about creating new variations, selection puts them to test. Selection reduces the variety by giving preference to some forms of variation rather than to others (Aldrich and Ruef, 2006). Competition is selection undertaken in a market environment the outcome of which is economic change (Metcalfe, 1998). Selection is tight to the concept of Darwinian "fitness" which states that the fittest variations will survive, while the unfit ones will perish. In economic terms "fitness" is equalized with economic efficiency. The variations which generate profit and can capture a significant market share are deemed fit to be the true winners. Defining the unit of selection, or what is to be selected, is the next logical step of our analysis. The obvious answer is the solutions which compete for dominance (The incumbents have various line of business of which one is digital payments, the same goes for some contenders as well). However, we decided to adopt a rather different approach. Objects of selection are not simple elementary traits but structures of much higher dimensions in which they are nested. Market chooses complex technological systems and not individual elements of technological knowledge (Dosi and Nelson, 1994). This suggests that markets do not select simple technology as a winner (e.g. QR codes, NFC), but rather a more complex constructions, which take into account also the business model, the distribution of complementary services (loyalty programs) and customer ownership.

According to the model proposed by Tushman and Rosenkoph the period of intense competition ends with the selection of a dominant design which we understand as the specification (consisting of a single design feature or configuration of design features) that defines the product category's architecture (Christensen et al., 1998). The end of the battle comes with the establishment of one or several dominant designs. Therefore, we witness a significant decrease in the number of solutions in the variation.

If in this case the regulatory asymmetry is still present, this legal incoherence can turn out to be a very important tool in this battle. The longer a new entrant stayed unregulated after it has reached critical mass, the more competitive advantage it will enjoy over its regulated competitors because it is not subject to regulatory burdens. Although the early commercial stage was primarily dominated by self-regulation, this mechanism seems to be not very useful in the later commercial launch phase. The

main reason for this is the fact that self-regulation is not suitable for phases with high level of competition because of its voluntary nature. In this stage characterized by heated up battle for dominance the regulatory void due to the lack of any particular CAC regulation can pose significant threats to the proper functioning of the market. The role of the regulators here is to ensure consumer protection and fair competition (or level playing field for all the actors). This cannot be achieved by the EPC alone or by any other self-regulatory association. Therefore the European Commission decided to adopt the Payment Service Directive (PSD) in 2007.

The unbundling of the incumbents (introduced by the Proposal for Amendment of the PSD (European Commission, 2013b) also aims at making them more innovative. As their main business model is challenged, they have to come with more innovative payment solutions and business models in order to retain their customer base and to extract more value from it. It is important to note here that the unbundling of the old (or the infrastructure of the incumbents) occurs right before a new infrastructure manifests itself.

The asymmetry, however, is still present as the different payment service providers continue to be governed by different rules. The asymmetry stems from the different functions that each of them can perform. The asymmetry is furthermore enhanced by the different capital and informational requirements that the different service providers face.

3.4. PHASE 4: INFRASTRUCTURE

At the final stage the environment in which organizations operate is constructed in such a way that it constraints their ability to change over a significant period of time. This coincides with the era of incremental change described in the Tushman-Rosenkoph cyclical model where after initial disruption a stable period of slow change is established.

The ability of the winner to innovate is seriously restrained as it cannot fully absorb new inventions on a constant basis. The winner has established user base, successful business model and high lock-in effects. Therefore, there is little incentive to innovate as the main efforts are focusing on preserving the leadership position by retaining the already gained market share. As a result of its victory, the winner is granted a concession to establish its own infrastructure. This usually allows the winner to exclude other competitors and new entrants from accessing the newly established infrastructure and to raise the barriers to entry.

Soft law and self-regulation both work as preliminary or complimentary stages of hard law (Gonçalves and Gameiro, 2008). There are still some doubts about their effectiveness as regulatory instruments. They are often designed to promote more participation and dialogue, but sometimes they are also perceived as lacking transparency and accountability. This discussion can be seen in the evolution of SEPA. In 2013 the European Commission adopted Regulation (EU) No 260/2012 of the European Parliament and of the Council establishing technical and business requirements for credit transfers and direct debits in euro. The reason for this decision is explained in para 5 of the Regulation which states that self-regulatory efforts of the European banking sector through the SEPA initiative have not proven sufficient to drive forward concerted migration to Union-wide schemes for credit transfers and direct debits on both the supply and the demand side.

We argue that with the adoption of SEPA regulation, the hybrid governance mode of SEPA has changed towards more command-and-control regulation. SEPA is no longer a voluntarily initiative, but a regulatory requirement (Deutsche Bank, 2012). If a payment service provider provides payment services which are credit transfer and direct debit they have to be SEPA compliant. This helps us identify the SEPA Regulation as a CAC regulation which is usually defined as hard law. This legal mechanism incorporates standards and rules developed as part of self-regulatory process. However, due to the inability of the EPC to ensure fast adoption of the SEPA Rulebooks in the countries of the SEPA area, a stricter, more hierarchic approach is needed. Thus SEPA regulation ensures a high level

of regulatory symmetry.

The newly established command and control regulation (SEPA regulation) builds upon the existing command and control regulation as it cannot discard it completely. The residual element in the new legal regime comes from the existing anti-trust regulations. The main idea behind this is not to allow the accumulation of too much market power using new technologies and business models in a way that may distort competition. Therefore the anti-trust rules can be seen as additional layers of protection.

Regulatory bodies or political institutions see a need for change of the SEPA initiative which was also a response of the existing institutions to come up with an alternative through self-regulation. This discontinuity period overlaps with and carries on to phase 1 of our model.

4. DISCUSSION AND CONCLUSIONS

In this paper we have built a model that describes and explains the formation and development of digital payment infrastructure. To that end we rely on the combination of a number of theories and regulatory frameworks namely regulation, multi-sided platforms, evolutionary economics, and institutional isomorphism. The key characteristics of our model are summarized in the table below.

Phase	*Invention*	*Early Commercial Launch*	*Full Commercial Launch*	*Infrastructure*
Evolutionary Economics	*Speciation*	*Variation*	*Selection*	*Retention*
Nature of Payment Platform	*Single*	*Two-sided*	*Multi-sided*	*Integrated*
Legal Implications	*Regulatory Gap*	*Self-regulation*	*Hybrid Governance*	*CAC Regulation*
Regulatory Asymmetry	*High*	*Medium*	*Moderate*	*Low*
Competition	*Low*	*Moderate*	*High*	*Low*
Discontinuity	*Pilot*	*Viable Business Model*	*Dominant Design*	*Speciation*

Figure 2. Overview of key characteristics the digital payment framework

The invention phase triggers a process of speciation where a new product or a service is applied in another domain. This disrupts the old domain and leads to an invasion of new entities. The variation

of companies, which characterizes the early commercial launch, is put down to selection during the next stage. In the final phase the selected winner tries to retain its position and to raise the barrier to entry for new players.

The level of competition also varies during the different stages of the model. The invention stage is characterized by low level of competition as the new entrants are yet to test the market potential of their inventions. Therefore we define the platform as single since the new product or service is still developing. As the platform becomes two-sided during the next stage, the level of competition slowly rises, but the preference is given to cooperation. The competition intensifies as the platform matures and becomes multi-sided. After the selection the established winner faces low level of competition and tries to retain its dominant position by integrating more products or services to the already existing payment solutions.

The regulatory gap identified during the invention phase presupposes high level of regulatory asymmetry. As different self-regulatory initiatives try to fill the regulatory void, they encompass more and more entities and thus decrease the level of asymmetry. The voluntarily nature of these initiatives, however, does not guarantee a level playing field for all the actors. Therefore a regulatory intervention is needed to introduce a set of rules which will facilitate fair competition. As more regulatory intervention is gradually introduced, the level of regulatory asymmetry decreases.

Our key contribution is a model in which companies in the payment industry either under envelopment or launching an envelopment attack can place themselves and plan the best course of action. However it is an idealized model and in reality there are many solutions at different stages of the model. This also indicates that timing the launch of solutions with appropriate type of regulations can decide its faith. If it is too late, the regulatory window of opportunity may have shut. If it is too early, the incumbents will have the regulatory upper hand in the form of a (de-facto) concession.
Validation of the model can be achieved by testing its explanatory power in describing historical accounts of attempts to establish payment infrastructures. In a more prescriptive mode the model could be tested by its ability to offer guidelines as what to expect and do next for companies jockeying for a position for their solution in the digital payment market.

We encourage others to lift the model away from current niche of digital payment market and thereby perform a speciation of the model in other domains. The obvious domains are those also victim of the mobile phones disruptive march (e.g. the watch or the car or door keys) or domains where the EU is also regulating to achieve more innovation and competition.

The lack of any regulation for emerging technologies brings up the question when is the best time to regulate new entrants? We argue that regulating new entrants at the stage of invention will be counterproductive. More regulation will mean higher compliance cost, barrier to entry and less innovation. The right moment to regulate is when the entrant has large enough user base (i.e. it had passed the critical mass). In this case delayed regulation of entrants seemed to be a good regulatory choice.

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