5-2-2012

THE GENESIS AND EVOLUTION OF DIGITAL PAYMENT PLATFORMS

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THE GENESIS AND EVOLUTION OF DIGITAL PAYMENT PLATFORMS - A FRAMEWORK FOR UNDERSTANDING PAYMENT TRANSITION ROUTES

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Abstract

Payment transactions through the use of physical coins, bank notes or credit cards have for centuries been the standard formats of exchanging money. Recently online and mobile digital payment platforms has entered the stage as contenders to this position and possibly could penetrate societies thoroughly and substitute current payment standards in the decades to come. This paper portrays how digital payment paltforms evolve in socio-technical niches and how various technological platforms aim for institutional attention in their attempt to challenge earlier platforms and standards. The paper applies a co-evolutionary multilevel perspective to model the interplay and processes between technology and society wherein digital payment platforms potentially will substitute other payment platforms just like the credit card negated the check. On this basis this paper formulate a multilevel conceptual framework and shows, through examples of new digital payment platforms, how transitions and substitutions might occur. Finally we discuss how possible venues and routes of transitions appear in the genesis and evolution of digital payment platforms.

Keywords: Digital payment platforms, evolution, transitions, technology substitution

1 Introduction

In 1939 Luther Simijan created the "bankmatic automatic teller machine". He asked a company, now known as Citicorp, to trial it. After six months the bank reported that there was no need or demand for such a product:

"It seems that only a small number of prostitutes and gamblers are using the machines because they didn´t want to deal with tellers face-to-face" (Luther Simijan 1940. p. 48)

Almost thirty years later, in 1969, a second attempt to popularize the ATM was made and this time the invention caught widespread attention from banks and financial institutions. Today the inventions of Luther Simijan can still be found in ATMs, including the name "automatic teller machine". The genesis of the ATM shows common characteristics of innovation and development stages. Many solutions are invented and developed long before they become widespread. This is especially true for solutions that rely on institutional backing and widespread use to be established.

The history of technological evolutions brings other examples (e.g. the development of railroads, water way systems and road infrastructures) of how innovations have gone through different development stages before emerging as a dominant socio-technical landscape (e.g. as a modern version of the ATM which today can be found nearly everywhere).

In recent years the studies of the different levels and phases innovations must pass through have become more established (Geels 2002; Schot 2004; Smith 2007; Walker 2000). This interest concerns how long term and large scale shifts from one socio-technological system to another occur and uses insights from evolutionary economics (Hodgson 1993; Friedman 1998; Aldrich et. al. 2008), sociology of technology (Latour 1987; Law 1987; Pinch & Bijker 1989) and innovation studies (Elzen et. al. 2004). The arguments found in these contributions highlights the combinations of history, sociology and economics of technological change in order to capture the complexity in the dynamics of specific types of transitions. These major changes involve not just technological changes, but also change in markets, regulation, culture, industrial networks and infrastructure (Schot & Rip 1997; Geels 2004)

The concept of cash has long been a part of the socio-technical landscape. However many new digital payment solutions are currently evolving as niche innovation. Banking, transactions, money and payments is currently entering a new stage of online banking (Garcia-Swartz & Hahn 2006; Worthington 1995) and digital payment systems platforms are emerging as a phenomenon which possibly will penetrate societies thoroughly and substitute current payment technologies in the decades to come (King 2010; Linné 2008; Bergsten 1966).

As a result this paper uses theory on technology transition and evolutions to show how digital payment platforms simultaneously shape, are shaped and co-construct the conditions of society. By linking a level of niche innovation to socio-technical regimes and socio-technical landscapes we show possible venues of IT systems over time, space and social organization as they occur form the stable foundation of contemporary information infrastructures (Edwards 2007, Geels 2006).

We distinguish between niche innovation, socio-technical regimes and socio-technical landscape. This distinction reflects three levels in the process of evolutions over time. The niche-innovation is where radical innovation is observed. Initially the novelties are unstable configurations jockeying for an institutional position and a place in the market. The socio-technical regime is the currently dominating pattern of candidates. A regime consists of scientists, policy makers, users and special interest groups contributing to the technological development (Bijker 1995). Socio-technical landscape refers to an exogenous environment beyond the direct influence of niche and regime actors (macro-economics, deep cultural pattern, macro-political developments). As a result the socio-technical landscape is not one system or platform it is the constellation and configuration of various socio- technical regimes in a specific time and context (Edwards 2007, 2005; Geels 2002; Schot 2006). Changes at the landscape level usually take place slowly on average but occurrences at this level can push for new innovations to evolve.

This paper addresses one key research question; how do new digital payment systems grow and evolve over time? We attempt to capture and explain the static yet dynamic nature of digital payment systems in socio-technical process developments. The answers are comprised into a conceptual multilevel framework for understanding and managing the evolution of digital payment platforms. With the focus on the past trajectory and the path dependency to other technologies to show how earlier payment technologies are constantly challenged with new ones in a process of socio-technical evolution.

The paper is structured in six sections. Next we describe how money has become digital then, in section three, we describe the current literature on technology transitions. By looking into literature we correspondingly formulate a framework for transition routes of digital platforms. Hereafter, in section four we use empirical illustrations of three platforms to show routes of payment transitions in practice. On this basis, we discuss the possible venues for digital payment platforms and the relevance of our framework for understanding these. Finally in section six we make some conclusions concerning the future development of digital payment systems.

2 Background

Money is any object or record that generally is accepted as payment for goods, services and repayment of debts in a given socio-economic context (Zelizer 1997). Originally money was based on commodities (such as gold) where governments or countries made guarantees that the payment objects could be exchanged into e.g. gold at any time. In modern time nearly all money systems are based on fiat money. Fiat money is without intrinsic use value as a physical commodity and derives its value by a government legal tender which defines the mediums of payments allowed by a legal system to be valid for meeting a financial obligation in a particular country or region (Wallace 1978; Ritter 1995). Several types of money can be identified such as coins, banknotes, checks etc. These physical objects currently represent the dominant socio-technical regime as payment sources for smaller transactions (Zelizer 1997).

Where banks, financial institutions and centralized web-based platforms benefit from being able to convert money into a single, global and invisible payment units the departure from "old" payment artefacts such as credit cards, coins, banknotes and even checks appear to be a vastly more complex process for the individual user. For the individual user a digital payment system shifts the evidence of liquidity from the physical artefacts to digital figures. In various ways this changes the relations between an individual, time, space and the concept of bearer money[1]. The vast majority of digital payment systems make connections between a unique ID, an account, and a digital representation of liquidity and thus is not bearer money.

Today there are some examples of bearer money in digital form such as Goldmoney, E-gold, Pecunix and Bitcoins where a user can create an account based on generic data. These examples are peer-to-peer network, which enables payment at low cost without the need for centralized payment processors. Despite the attempt to build upon characteristics of earlier forms of money these platforms have had only limited success so far. It can be observed that battles between niche-innovations such as Bitcoins and the established socio-technical regime can (and almost certainly will) occur. In relation to Bitcoins a frequent problem faced by retailers is the high volatility of its exchange rate to the US dollar and the absence of futures and options permitting to hedge this volatility. In other words historically derived instruments in the current financial socio-technical regimes exclude new solutions, which do not operate by the same instruments and rules.

With the widespread use of mobile phones a new type of channel for payments is also emerging (Ondrus & Pigneur 2006). The mobile phone adds a new dimension of existence in time and space. In

[1] Bearer money is an accepted payment medium which is not registered anywhere to the owner (bearer). The person that holds (bears) the payment artifact owns it.

this particular dimension both the human styles of interaction and the conceptions of time and space change in co-constructive evolutionary socio-technical processes (Fortunati 2002). As a result the mobile phone has the possibility to build upon social behaviour attached to earlier payment artefacts such as the wallet. However the current niche-innovation in relation to mobile payment brings along complex processes of socio-technical settlements and choices. Consequently, digital payment systems are mutual shaping's between technology and society and the transitions from niche innovations to socio-technical regimes are complex processes filled with constraints from earlier choices and current constellations of dominant actors.

3 Theory on transitions

In recent literature there has been a growing interest in the genesis and transition between different technological regimes (Geels 2002; Schot 2004; Smith 2007; Walker 2000). Work on transitions and system changes have expanded under various terms, e.g. regime transformation (Van de Poel 2003), technological revolutions (Perez 2002), technological transitions (Geels 2010) system innovation (Elzen et al. 2004) and battle of standard wars (Shapiro and Varian 1999) and can be seen as co-evolutionary processes which involve technological changes as well as changes in other systems (Geels 2002, Edwards 2007). Perspectives from evolutionary economics emphasize the complex interdependencies and competition in transformation processes of institutions and agents from an evolutionary methodology (Aldrich et al. 2008). For David (1985) Katz and Shapiro (1986) and Arthur (1989) the actual nominations of which technologies that prevail is path dependent. These perspectives often use detailed historical case studies (e.g. the transitions from sailing ships to steamships, the transition from horse-and-carriage to automobiles and the transition from propeller-piston engine aircraft to turbojets) to illustrate path dependent dynamics of technology transitions.

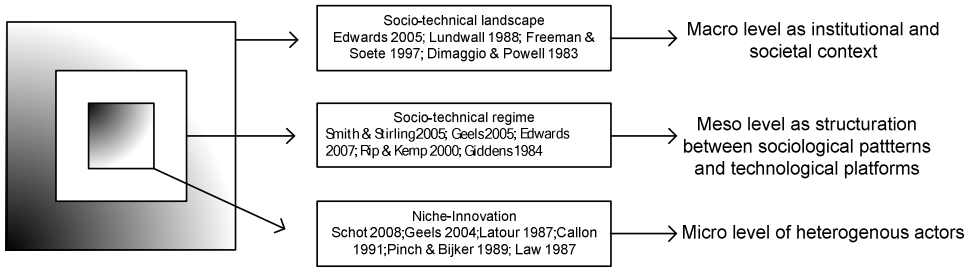

Figure 1 Multiple perspectives and appropriate theoretical lens

3.1 Niche-innovation

Niche innovation draw primarily upon theory on heterogeneous actors in networks (Callon 1980, 1991; Latour 1988, 1991; Bijker & Law 1992; Pinch & Bijker 1989). Broadly these directions are used to conduct microanalysis of the relations between actors, networks and technologies. The niches are where the radical innovation evolves as contenders to a position in the market. Initially the novelties are socio-technical heterogeneous configurations (Schot 2008) at this stage niches evolve as "incubation rooms" protecting novelties against mainstream market selections (Geels & Schot 2008). The incubations rooms emerge, as innovations at this point are not concerned with existing customers and backwards-compatible functions. The novelties are carried and developed by small networks of dedicated actors often outsiders or fringe actors. Small networks of actors support novelties on the basis of expectations and visions (Damsgaard 2002). Gradually a dedicated community of engineers and producers emerges, collectively directing their activities to the improvement of the new technology of its own (Geels 2007) Learning processes, such as imitating and identifying needs in

existing platforms results in attempts to link different elements in a seamless web (Damsgaard 2002). As the niche innovation not yet consists of a dominant design actors improvise and engage in experiments (e.g. a popular way to attract first time visitors is e.g. to offer gift or discounts) to work out the best design and to find out what user want (Geels 2002). Transitions from this phase occur when the niche innovation manages to get the attention from institutional actors.

3.2 Socio-technical regime

The socio-technical regime builds upon the theories from niche innovation and draws in addition upon theories about structuration between technology and society (Giddens 1984; Hardy et al. 2001; Orlikowski 1996; Monterio & Hanseth 1996; Edwards 2007). A central issue at this level is the relationship between a technological innovation the rules, practices and power coalitions of dominating institutions.

Socio-technical regimes are the source of dynamic stability of a technology because their rules are constantly shared and reproduced (Schot & Geels 2007). At this level the ability to make users adopt a service is essential. This creates momentum and network effects and thereby chains them to the specific platform. If the platform fails in installing its proprietary service the community is left open for other platforms.

A socio-technical regime is an existing and currently dominant pattern of IT platforms. The socio-technical regimes accommodate the broader group of community of social groups and their activities. A socio-technical regime is the rule set grammar embedded in a complex engineering practices production process technologies, artefacts and personas embedded in institutions and infrastructures. Once the platform community is well established there is an on going need to nurture it (Damsgaard 2002). The challenge is to keep evolution going and incorporate new services and technologies as well as avoid revolutions caused disruptive technologies. Transitions to socio-technical landscape occurs when enough support from other institutional actors have been established. At this point connections to other socio-technical landscape solutions will also be made.

3.3 Socio-technical landscape

Macro level theory of socio-technical landscape builds upon the theory from the two lower levels and extends these with more broad perspectives on societal and institutional development (Dimaggio & Powell 1983; Callon 1980; Calas & Smircich 1999; Freeman & Soete 1997; Tsoukas & Chia 2002). The socio-technical landscape refers to an exogenous environment beyond the direct influence of niche and regime actors (macro-economics, deep cultural pattern, macro-political developments). The landscape is not one system or platform it is the constellation and configuration of various socio technical regimes. From the perspective of the socio-technical landscape constellations of communities can be viewed when regimes become unstable and opens up because of persistent problems or landscape changes (Geels 2007). This can also be termed “overload” when a technology is use in different ways than the original design afforded. The unexpected and unintended use of current technologies creates pressure on the existing landscape. The loosening up of the existing regime stimulates actors to experiment with other technical options and as a result new possibilities for niche innovation. The metaphor of the landscape is used because of the literal connotation of relative hardness and to include material aspects of society such as arrangements of cities, highways and electrical infrastructures. The landscape also refers to the wider environments that affect socio-technical development such as globalization, environmental problems and cultural changes (Geels 2002; Schot 2007; Edwards 2007; Rip et al. 1998)

As banking, transactions, money and payments are currently entering a new stage of online banking (Garcia-Swartz & Hahn 2006; Worthington 1995). This paper use a multilevel perspective on technology transitions to show how digital payment systems platforms are likely to penetrate societies thoroughly and substitute current payment technologies in the decades to come (King 2010; Linné

2008; Bergsten 1966). With the mobile phone we are facing, within mobile payment solutions, niches of innovations to bring about new socio-technical regimes. At the moment solutions are developed and used by various quick-service oriented industries such as public transportation, tollbooths and fast-food restaurants (Ondrus & Pigneur 2006). However the emerging IT platforms have not yet grown to become social-technical regimes.

As seen in the case of Bit coins and peer-to-peer networks the current constellation of stakeholders in the market are crucial for the transition of new payment solutions as they act as gatekeepers. The current actors in the socio-technical regimes are not willing to give earlier valuable concessions for the benefit of a transitory technology that is still in its infancy and depended upon these concessions. This means that several settlements concerning a new technology will be transformed on the basis of earlier and current social, economic and cultural socio-technical configurations of actors in the regimes.

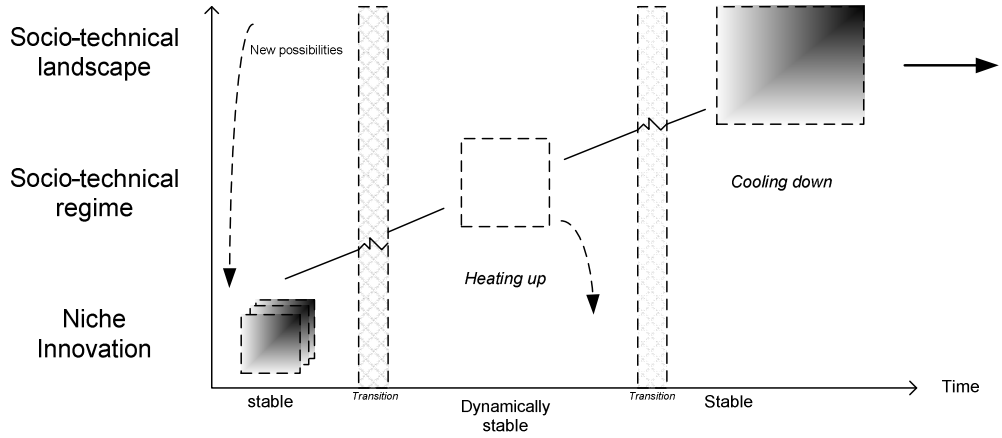

Figure 2: Transition routes of digital platforms

Figure 2 presents our multilevel perspective. Our framework entails three levels with distinct characteristics based on diverse theoretical contributions. The transition route entails an unstable, dynamically stable and stable phase over time.

Innovations that transform from niche-innovation all the way to becoming a part of the socio-technical landscape are rare events. Most of the time they are out-competed by more efficient technologies embedded and nurtured by a set of complementary technologies and interest groups (Mokyr 1990). Only dramatic change in the environment may change the rules of the game and allow transitions routes to open in so-called "windows of opportunities".

As illustrated in figure 2 the route of technological transition entails a period of "heating up" strategic manoeuvring between actors takes place at the socio-technical level. This is followed by a period of "cooling down" which narrows down the number of technical options.

This view corresponds with the so-called punctuated equilibrium perspective applied to technical evolution and IS development (Tushman & Anderson 1986; Sabherwal & Hirschheim 2001; Lyytinen & Newman 2008), which argues that technological development constitutes an evolutionary process punctuated by rapid discontinuous change. For long periods of time, technological change is relatively stable, proceeding along technical trajectories in an evolutionary manner. These periods are punctuated by brief periods of rapid change, illustrated in figure as transitions. An important addition offered to the punctuated equilibrium approach recently (Schot & Geels 2008; Suarez & Olivia 2005) is the emphasis on the destabilization of the prevailing socio-technical regime before the new innovations can flourish. It is hard to see why firms and users should would adopt a technology which is inferior to the one with which they already work (David 1982). However when actors at regime

level recognize that support for the regime disappears it is the time for a transition. This development creates the temporal rationale for investigating new and radical options.

At the socio-technical level "heating up" from social movements and institutional actors try to delegitimize the regime by framing industry practices as "outdated", "irresponsible" or "unacceptable" (Oliver 1992) without having settled upon as new solution the solve these problems.

This phase is characterized by dynamic stability, meaning that innovation still occurs but is incremental in nature leading to technical trajectories and path dependency (Geels 2002). At this point other regime actors develop discourses that maintain or restore legitimacy when they are faced with problems or criticism. As a result stability is only dynamic as competition occurs between concrete platforms without undermining the evolution of the whole regime. When some contenders manage to transform into the socio-technical landscape they become stable. The concept of stability here emphasizes that the constellations of platforms in this phase is difficult to change and interest and discourse aiming to do that is "cooling down" (Mokyr 1990; Geels 2010: Geels & Schot 2008).

4 Empirical illustrations

This section will give three brief empirical examples of how payment and digital payment platforms evolve or have evolved according to our presented framework. We present these examples to illustrate how our framework can be used both in descriptive analyses as well as to discuss the future development of digital payment platforms.

4.1. ATM route of transitions

As indicated in the introduction of these paper costumers were hesitant to trust their money to the new technology of the ATM invented by Luther Simijan in 1939. In the first 25 years in the life of the ATMs they were niche innovation not able to get attention from the existing socio-technical regime. The solution was dormant for almost 25 years until it was finally made a key part in destabilizing the existing regime as banks began to see the value in ATM machines. The destabilization of the regime was achieved due to the technical interrelatedness of other new innovations. In 1967 the cash dispensing machine was invented, to use the machine, costumers had to buy paper vouchers from the bank tellers. They could return to the bank after hours and feed the vouchers into the cash-dispensing machine to receive cash. The following year the paper voucher was changed to a plastic card that was kept by the machine after each use. These parallel innovations created a "heating up" situation destabilizing the exiting regime and creating a window of opportunity for a more stable version of the ATM.

In 1969 the first ATM machine to feature reusable plastic cards for bank customers were installed. The cards were encoded with a magnetic strip making them secure and reusable. At this point the innovation of the ATM (started by Luther Simijan in 1939) was ready to start its transition into a socio-technical regime. Evolving into a socio-technical regime many banks began to purchase ATMs in an effort to keep customers from switching to other banks. Within four years the platform sold more 2000 machines in the US despite its very high price tag. The following decades banks from all over the world began to purchase ATMs as they were now the industry standard and thereby they became dominant in the socio-technical landscape. ATM machines were originally connected directly to an individual bank. In 1974, the first networked ATM machines were created. This allowed customers to get cash from any ATM machine in the world, regardless of bank affiliation. It also allowed banks to place ATMs in more areas, including shopping centers, sports arenas and even on cruise ships. Throughout the 1970s and 1980s, interbank networks like Cirrus and Plus were created to authorize transactions between banks. Today 1.5 million ATM machines are in use throughout the world at the machine is a stable part of the socio-technical landscape in many parts of the world (Ondrus 2009; Zelizer 1996; Linné 2008). Among other things the story of the ATMs shows the importance of

institutional attention to destabilize a current socio-technical regime. Moreover sometimes other and parallel innovations have to be invented before transitions can take place.

4.1 Dexit route of transitions

The Dexit Service was proposed as an alternative to cash for small everyday purchases. Dexit operated through a tag which either could be in physical form (e.g. in a key chain) or a phone tag. As a phone tag Dexit operated through Radio Frequency identification (RFID) which meant that the tag had to be scanned on a Dexit reader, hereafter signals from the terminal captured information from the microchip inside the tag and authenticate the connection to a specific account. Dexit did not correspond directly to a person's bank account but was an account in itself which had to be refilled. In its technology the Dexit tag was more secure and faster than traditional credit or debit cards. Dexit was developed in Canada from 2001 and onwards. (Waxer & Cindy 2005). The main attempt of Dexit was to create a platform in peer-to-peer networks building upon social behaviour attached to the current behaviour surround physical money. As the system of Dexit grew from initial novelty it formed communities with small retailers in Toronto, including big banks, who would allow users to refill their cards at their branches, and Telus, who stuck the tags on their phones. By 2004, there were 225 merchants on board, and 25,000 consumers signed up. Also in 2005 Bell Canada decided to offer the service to its enterprise IP network customers. As a result Dexit was now a part of the socio-technical regime. In 2006 the following year, it was announced that it would set up a biometrics-based telephone system to add value to Dexit tokens. However in 2006 Dexit was quietly morphed out of the market and almost all payment terminals was removed from stores and offered refunds of all the stored money on the Dexit tags to costumers (Lalani & Ritchie 2005).

The story of Dexit exemplifies how succesfull niche innovation operated in small unstable networks of dedicated actors . Many small networks were created and attracted customers by offering gifts such as preloaded cards on new signups. However Dexit ran into problems in the transitions socio-technical regime to socio-technical landscape. In the battles to breakthrough into the landscape the elements of Dexit alone did not succeed in destabilizing or align with the stabilized dominant platforms in the socio-technical regime. Dexit had to put up new terminals everywhere in order for their digital payment system to work. At some point during 2005 the management board of Dexit experienced that "exploiting the potential of world class technology had been eluded by management teams, board of directors and other institutional actors" (Financial Post 2008). As Dexit formed relations primarily with small merchants in Toronto they became increasingly vulnerable to these networks and lost acceleration as the merchant decision-making process turned out to be significantly longer than expected. As a result stronger connections to already installed institutional mass systems were never achieved. Consequently Dexit ended its time as a prominent and bold niche innovation in 2006.

Dexit was a bold attempt of innovation. It aimed to win market shares due to problems, inefficiencies and unacceptable consequences of the current payment regime. The solution got initial attention from many small institutional actors but was however not able to transfer this attention into binding commitments from current large scale institutional actors. As the solution was not able to either align with key institutional actors or team up with actors succeeding in destabilizing the current socio-technical regime Dexit quickly lost its position as a future contender in the market.

4.3 Octopus route of transitions

Sometimes niche innovation initially bundles or builds upon the existing socio-technical regime and as a result gain strong institutional backing from an early stage. In this case earlier innovations (such as Dexit) had already been a part of destabilizing the regime, so transition routes for other platforms with institutional backing were less complicated. Such an example is found in the payment platform of Octopus. Octopus is a cashless payment card which has its basis in the public transportation system of Hong Kong. It was introduced in 1997 and is in 2011 used in every public transportation in Hong

Kong. Octopus has more than 10 million transactions every day and is used by 95% of the population. The card does not need any physical contact between the card and a terminal or payment station which enable this platform to become and ingrown and almost invisible part of an already existing socio-technical regime (the transportation infrastructure). If a person has the card in a pocket and passes the payment terminal, the payment is then registered without further action from the traveller. The Octopus route of transition started in a ”heated up ” captive market with high transaction volume as the regime of coins had already been destabilized. Both users and transit operators welcomed the relief from coins the octopus card gave them. As a result this enabled the contacless smart cards to provided superior effeciency right away. Insitutional actors furthermore made it impossible not to buy a new card as old payment platforms all expired over several months (Chau & Poon 2003). A final key aspect of the transition rate of Octopus is the trust among the involved stakeholders. The willingness to stardardize across transport operators were high since Octopus was simple and built upon the current socio-technical landscape. Politically negotiated legislation also made coordination and partnering with direct competitors more easy. Currently Octopus is a contender to be used in various other businesses as the primery identity card in Hong Kong. As a result the digital payment platform is transitioning towards becomming an even more dominant platform in the broad socio-technical landscape. The case of Octopus reveals the importance of initial attention from institutional actors to transform from niche innovation into the socio-technical regime. Furthermore it shows that attention is not enough. Several key insitutional actors have to align and support the solution for it to transform into a socio-technical landscape.

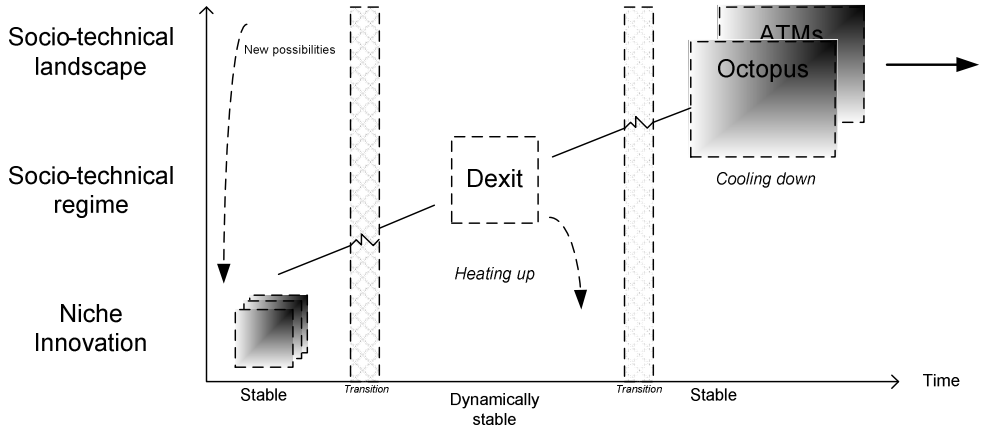

Figure 3: Route of transitions of Dexit, Octopus and ATMs

Figure three places the three empirical examples in our model for understanding the genesis, evolution and transitions of digital payment platforms. Dexit existed as a niche innovation and socio-technical challenger from 2004-2010, Octopus is currently a dominant socio-technical regime in Hong Kong where elements of the platform have transformen into a socio-technical. The ATM is currently a stable part of the socio-technical landscape in most countries worldwide.

5 Discussion and implications

By incorporating a multilevel perspective entailing a level of niche innovation, a socio-technical regime and a socio-technical landscape, we provide a frame that enables modelling of how digital payment platforms evolve and transits' over time. The historical perspective of our model aims not only to understand immediate needs and interests. Instead a respect for earlier technological choices and earlier social constellations (in socio-technical regimes) provides the possibility for deeper cultural, intellectual or economic origins of social choices. As our origin of understanding derives

from money and digital payment platforms we argue to provide a non-linier frame for understanding how the specific characteristics of money has evolved and potentially will evolve in the years to come. Our research has implications for both theory development and practice. For theory we follow a stream of literature which represents a growing interest in the genesis and transition between different technical regimes (Geels 2007; Schot 2004; Damsgaard 2002; Poel 2003) our main contribution consists of reformulating some of these thoughts into the context of payments and illustrating how different theoretical perspectives can be used at different levels of the evolution process. As new digital payment platforms are evolving rapidly we also argue that this particular domain is of outmost relevance in the study of contemporary characteristics of niche innovation and transitions today. We argue that our framework also has practical implications as many of the niche innovations within digital payment platforms today can benefit from exploring the perspectives. The specific characteristics, components and technical interrelatedness between money and digital payment platforms are necessary to explore as a contender for at position in the market. Especially the dynamics within the transitions from niche innovation level into a socio-technical regime is important to acquire knowledge about when competing in the market, making choice of which and what to support. A key lesson from our paper is the importance of initial institutional attention followed by strong institutional backing in the transition phases.

6 Conclusion and limitations

In this paper we have presented a framework to model how digital payment systems grow and evolve over time. We have introduced the reader to literature on technology transitions and on this theoretical foundation we have presented our framework for future understanding of the transition routes of digital payment platforms. In three brief empirical examples we argue to have captured aspects of unstable, dynamically stable and stable phases of evolution and to show the importance of institutional attention and backing in order for transitions between levels to occur.

As various digital payment platforms currently are either niche innovations or socio-technical regimes aiming for a place in the socio-technical landscape our argument is that innovators should not endlessly seek to improve their niche innovation but instead seek the attention of institutional actors in the existing socio-technical regime. Our framework will enable current actors in the digital payment market to reflect upon their own situation and consider where their current innovations are placed in relation to our levels and phases. In this sense our paper can potentially seek to show actors the importance of making their innovation compatible with the power networks and political agendas of the institutional actors. It is only through the engagement of the institutional actors that a niche innovation can be lifted up to become a real challenger.

In this conceptual paper our aim has been to present our framework. We provide empirical support for elements in the framework in three empirical examples of ATMs, Dexit and Octopus. However, the format and limited amount of space in this paper did not allow us to present more thoroughly investigations into the historical accounts and dynamics of these examples. Furthermore at this early stage we did not apply the framework directly to current emerging digital payment systems.

As a result interesting avenues for further research is to apply our model in current practical situations of niche innovation within digital payment. Practitioners who are interested in digital payment platforms could also use the framework to reflect upon how well they are connected to current institutional actors and how they are positioned in relation to other contenders in the market. Finally the attention towards the many complex factors determining whether or not a transition to a higher level can occur is beneficial to most contenders at niche innovation and socio-technical levels.

7 Acknowledgements

This work was in part carried out with the support of Copenhagen Finance IT region (www.cfir.dk) and was funded by the Danish Enterprise and Construction Authority grant number ERDFH-09-0026. Any opinions, findings, interpretations, conclusions or recommendations expressed in this paper are those of its authors and do not represent the views of the funding agencies.
During the formulation of the framework presented in the paper comments and discussion in the "Cashless Society" theme at Department of IT management at Copenhagen Business School has been very fruitful and beneficial.

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