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FLUID STANDARDS: A CONCEPTUALIZATION OF THE CHANGING WORLD OF STANDARDS BASED ON A CASE STUDY OF AN M-COMMERCE PLATFORM

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Fluid Standards: A Conceptualization of the Changing World of Standards based on a Case Study of an m-Commerce platform

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Abstract:

The standardization literature has acknowledged the changing game of standardisation by discussing the need for standards to be open, flexible, negotiated, evolving and composed of technological as well as social elements. At the same time, the literature is fragmented and has focused on each of these characteristics in isolation. Our concept of fluid standards is the main contribution of this paper and an attempt to bring this literature together and extend it by conceptualizing fluid standards as packages of multiple vital characteristics. We aim to contribute to the research on the changing and increasingly heterogeneous nature of (ICT) standards and how to participate in standardization processes to develop standards offering the required flexibility accommodating for rapid innovation and technological change.

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1. Introduction

Research on ICT standards is in its infancy. Still, its volume, as well as assumed importance, is growing (for example illustrated by the Special Issue of MIS Quarterly on the topic published in August 2006). This reflects the growth in the number of and importance attributed to ICT standards (Brunsson and Jacobsson 2002; Romer 1990; Schmidt and Werle 1998, Lyytinen and King 2006, Brunsson et al. 2012, Timmermans and Epstein 2010). But it also reflects the rapid growth in the variety of standards. Andrew Barry (2001), for instance, argues that we should see the European Union should primarily as a standardization effort aiming at developing the standards needed for European integration. This includes ICT standards but also the standard Euro currency as well as standards for chocolate and the shape of cucumbers. Such standards will, however, be closely related to and embedded into ICT standards implemented by the vast range of ICT solutions required to make the envisioned European integration real. And as the number of standards is growing, so are also the connections and interdependencies between them which generates a need for focusing on ecologies of standards rather than individual ones (Nickerson and zur Muehlen 2006).

The growth in research on standards also reflects a change in requirements of standards due to an increasingly complex and more rapidly changing world caused by, for instance, more complex technological systems, networks and globalization processes. This complexity again leads, according to Brunsson et al. (2012), to a need for more dynamic and flexible standards (also discussed by West 2003), which again warrants more research on the dynamics of standards as well as new requirements to standardization processes and their organization. Updegrave (2007), for instance, argues that the exiting standardization system has its roots in the industrial era of the 19th century and was designed to address the needs of such an economy and is ill-suited to meet the demands of the 21st century. According to Updegrave (ibid.), the need to meet such changes is reflected in the rapid growth of consortia as an alternative approach to the traditional formal bodies of standard making. Brunsson and Jacobsson (2002) summarize these trends into what they describe as the emergence of a whole new "world of standards."

Telecommunication has traditionally been a domain where standards have played a central role. However, during the last decades, this sector has changed dramatically through digitalization, liberalization, the development and diffusion of mobile communication technologies, processes of convergence between IT, telecom and media technologies and sectors, globalization processes, etc. In a global, interconnected world, standards bridging domains, industries and technologies play an increasingly important role. At the same time, different standardisation approaches, logics and regimes meet, challenging existing power structures and necessarily leading to the relegation of traditional domain-specific standardisation bodies. There is a pressing need for all actors in the ICT industry to understand the implications of these developments and how to strategically position related to standards and standardisation work. The aim of this paper, then, is to explore the changing nature of (ICT) standards and standardisation in general and within m-commerce in particular. More specifically, we address the following research question: what are the critical characteristics of standards and standardization processes that make them fit for a complex and dynamic global world. We do so by highlighting their "fluid" (in Actor-Network Theory terms) character based on a case study of the CPA, which is an abbreviation of the full name Content Provider Access,

standard for distribution of content services for mobile phones. We outline the initial establishment of this standard in Norway and its later internationalization (by being transferred to a few other countries). The standardization literature has acknowledged the changing game of standardisation by discussing the need for standards to be open, flexible, negotiated, evolving and composed of technological as well as social elements. At the same time, the literature is fragmented and has focused on each of these characteristics in isolation. Our concept of fluid standards is the main contribution of this paper and an attempt to bring this literature together and extend it by conceptualizing fluid standards as packages of multiple vital characteristics. We aim to contribute to the research on the changing and increasingly heterogeneous nature of (ICT) standards and how to participate in standardization processes to develop standards offering the required flexibility accommodating for rapid innovation and technological change.

We have organised the paper as follows. In the next section, we present related research on standards, i.e. research drawing upon Actor-Network Theory and on the flexibility and dynamics of standards. In section 3, we will present our conceptualization of fluid standards. In section 4, we outline our research approach and methodology. We present our case study in section 5. We first describe the initial development of the standard in Norway, followed by a description of its transfer to Malaysia, Hungary and Ukraine. Section 6 provides an in-depth discussion followed by section 7 that summarises our key points.

2. Related Research on the Changing World of Standards

In this section, we review the existing research on the changing world of standards. Our point of departure is the conceptualization of the socio-technical nature of standards as well as novel perspectives on the need for flexibility and the dynamic nature of standards and standardisation.

2.1 ANT Based Research on Standards

In parallel with the growth in number, variety, and importance of standards, the scope of standards research has expanded. This expansion includes increasing attention to the relations between technical standards and its non-technical (organizational, political, social, economic) context. This stream of research has been heavily influenced by Actor-Network Theory (ANT), seeing a technical standard as inseparable from its non-technological context or seeing the standard itself as a mix of technological and non-technological elements. A notable example of this stream of research is Bowker and Star's (1999) seminal work on coding and classification standards (in particular the International Classification of Diseases) and how such standards are tied together with the specific practices where they are used. Another stream of ANT inspired standardization research has addressed the relations and interdependencies between technical (IT) standards and procedural standards. Timmermans and Berg (2010), for instance, have explored this issue with the domain of health care (evidence-based medicine) and Poon (2009) in the finance industry (the emergence and use of the concept of sub-prime as a standard for mortgage risk calculation). Hanseth and Monteiro (1997) explored the relations between individual and aggregate elements of an ICT standard, the architecture the technical standard is based upon, and the rules for defining standards within a standardization body. They further focused on the organizing of the standardization activities are linked together into an actor-network and how essential

aspects of the standard are unintentionally embedded (or inscribed) into this actor-network.

An example of ANT inspired research of particular relevance to our discussion is Fujimura's (1996) analysis of the transformation of cancer from 'viruses to genes.' She argues that the successful design of what she calls a 'standardized package' was the main factor explaining how this transformation was made possible. The term 'standard package' points to the two crucial aspects: it was a package that contained several different interdependent elements, and, second, both the individual elements and the package as a whole were standardized. The elements in the 'genetics for cancer researchers' package were a set of techniques, tools, and instruments required to do this kind of research, which included a standardized breed of mouse (a real biological one! - trademarked 'OncoMouse'). Further, the package also included the genetic knowledge required to use the tools and techniques correctly. The standardization of such tools, instruments, techniques, materials (including the mouse), and knowledge was a precondition for the comparison and accumulation of results and knowledge among cancer researchers, which are also necessary to make a paradigm work. For such a package to be effective, more requirements than just being accepted as a standard have to be satisfied: the package also has to 'scale', in that the tools, instruments, and materials have to be low cost and the knowledge required should be easy to learn. Those involved succeeded in designing the package so that these requirements were fulfilled. Our concept of fluid standards introduced below is based on a socio-technical perspective and concurs with Fujimura by understanding standards as packages of components of various kinds.

2.2 Perspectives on Standardization as Dynamic Processes

Standards are commonly seen as stable after their definition and, accordingly, their dynamics as a more or less linear sequence of stages: definition, implementation, diffusion and use. This staged model is reflected in most formal standardization activities, like in telecommunication and also widely adopted in areas like health care (Hanseth et al. 2012). This model is in contrast with the one used in the development of Internet standards which is based on a more bottom-up, experimental and evolutionary approach (Hanseth et al. 1996). The Internet model is experimental along two dimensions: the development of specific standards and the development of the Internet as a whole. Abbate (1999) describes how the Internet is developed layer by layer from the bottom. When the standards at one level stabilize, this layer serves as a platform for experimental development of the standards at the next level.

Fomin et al. (2003), also propose a dynamic process model of standardization, called the D-S-N model, which sees development and diffusion of standards as integrated and overlapping. Their model integrates separate lines of inquiry to standardization activities including Simon's theory of artefact design (D), Weick's concept of sense-making (S) and Latour's concept of negotiation in socio-technical networks (N), and organizes them into a hierarchically organized web of standardization events. Similarly, Botzem and Dobusch (2012) focus on the long term evolution of standards and propose a process model where the evolution of a standard is seen as what they call a recursive relationship between input and output legitimacy, i.e. the legitimacy a standard obtain through participation in the definition of a standard, and the legitimacy a standard obtain based on its adoption.

Hanseth et al. (1996) see the long term evolution of (infrastructures and their) standards as driven by a tension between stability and standardization on the one hand and flexibility and change on the other. Their focus is on large technological systems, or infrastructures, composed of numerous standardized components. Hanseth et al. (ibid.), based on a comparative study of the ISO/OSI and the Internet approaches to standardization, see the tension between stability/standardization and flexibility/change as a combination of mutual support and contradiction, i.e. a duality in Farjoun's (2010) terms. On the one hand, one component's stabilization through its standardization makes the overall system more flexible in terms of enabling the development, and further on standardization, of new and additional components extending the system as a whole. On the other hand, the development of additional components produces new requirements to the standardized components, i.e. generates a need to change them. A complex technological system needs to change over time to be sustainable. But all components cannot change all the time while keeping the system working. That means that some components need to be kept stable when others change while also some components need to change if others are to be kept stable. This tension between standardization and flexibility is also found to be a critical factor in the development and evolution of information infrastructures in sectors like health care (Grisot and Vassilakopoulou 2013) and banking (Raymond et al. 2014).

Pollock et al. (2007) and Gizaw et al. (2016) argue that researchers tend to over-emphasize the gap between localized practices and standardized, generic solutions. They found that over time there is a subtle and complex interplay between suppliers, intermediaries and users that determines the balance between standards and organizational diversity. This includes, for example, flexible configuration, the construction of templates, the smoothing of differences and the generalization of requirements. This process is institutionalized and managed by the "software community", and results in the generification of software packages, i.e. software that can serve a large number of organizations. This process then is a standardization process where a specific solution is made more general to serve the needs of a larger user community, i.e. to work as a general standard.

Hanseth et al. (2012) examined the strategies for developing standards applied in nine longitudinal cases aiming at developing infrastructures supporting information exchange between institutions in the Norwegian health care sector and the extent to which they enabled and contributed to the development of new or improved medical services. They identified three generic standardization strategies which they called anticipated standardization, integrated solutions and flexible generification. They argue that the first two of the strategies did not support service innovation, while the strategy of flexible generification did so. This "flexible generification" strategy delivered a wide range of successful solutions – solutions that offered new and improved services. Its evolutionary approach was crucial for developing simple solutions that could be developed for reasonable costs within reasonable timeframes. This approach also allowed early user feedback based on the use of running systems which was seen as crucial for improving the systems to fit user needs. And further, a mere experimental approach also generated new ideas about how technology can be designed to support new and improved health care services and not just speed up existing paper-based practices.

A rich picture of standards dynamics, and the issues involved, in the "new world of standards" is described and discussed in Egyedi and Blind (2008) by means of a number of case studies. They illustrate that there are significant varieties among standards. Some changes frequently, others not and the scope of some changes are wide, others narrow. Among the issues addressed are problems and challenges when standards change and strategies to cope with changing standards. When standards change problems may emerge related to the accessibility of archival data and incompatibility between components implementing the standard. Standards change because the context they need to fit into changes. But how they change is influenced by the nature of competition between different standards and technologies. And a standard may change in different ways. Egyedi and Blind (*ibid.*) identifies three such ways: extending a standard with new features and attributes, adding (or "grafting", see, e.g. Sanner et al. (2014)) a new standard to an existing one, and replacing one standard with a new one.

Genschel (1997) is making the rather paradoxical argument that fragmentation actually may improve standardization. He substantiates this argument with several cases from telecommunication where he demonstrates that the existence of competing standards and standardization organizations contributes to continuous improvements of the standards. Then the development of improved standards over time, compared to cases where such fragmentation and competition do not exist. Reinecke et al. (2012) made similar findings and argued that a "standards market" may contribute both to the successful evolution of standards as well as the domain where they are implemented.

While the traditional and archetypical approach to standardisation in, e.g. telecommunication is portrayed as top-down, linear and stage driven, recent research shows that standardization also unfolds as non-linear and dynamic processes. These dynamic processes are more apt in a dynamic and changing world.

2.3 The Flexibility of Standards

The more dynamic world of standards, in particular, generates new and stronger requirements regarding standards' flexibility. Van den Ende et al. (2012) argue that the more flexible a standard is, the more easily it is to adopt and the more successful it is. They draw this conclusion based on an analysis of three standards battles: Blu-ray versus HD-DVD, USB versus Firewire, and WiFi versus HomeRF.

A standard's flexibility depends on its specific features. Hanseth et al. (1996) make a distinction between use and change flexibility. Use flexibility means that a standard can be used in many different ways and different areas without being changed while use flexibility means that the standard is easy to change. They further point out that these two kinds of flexibility are related and that the overall flexibility of a standard is the sum of these two. Use flexibility implies that a standard does not need to change that often, and, opposite, more limited use flexibility means that a standard needs to be changed more often and, accordingly, the standard needs to be easier to change. Hanseth et al. (*ibid.*) point to one aspect of a standard making it flexible to change: simplicity. Further, they argue that a standard's simplicity depends on the approach used to define it. They argue that a top-down specification driven approach often will lead to more complex, and accordingly less flexible, standards than a more bottom-up and evolutionary process. This argument is supported by the analysis of the ISO/OSI and Internet standardization approaches. Tilson et al. (2010) make a distinction between upward and downward

flexibility of Digital infrastructures and their standards. Upward flexibility means that new standards or services can be implemented on top of existing ones. In contrast, downward flexibility means that one standard or service can be implemented on top of different underlying standards and services.

Building upon Hanseth et al. (1996) Braa et al. (2007) present a more elaborated framework for developing infrastructures and their standards which they call the "flexible standards strategy." The framework is based on an extensive action research programme developing information infrastructures for health care in a considerable number of countries in Africa and Asia. Using complexity theories to interpret the outcomes of the action research, they propose a strategy whose two main components are to create an attractor that emerges as a new standard and which evolves into a system of standards, and secondly, to suggest that the individual standards must be crafted in a manner which allows the whole complex system of standards to be adaptive to the local context.

The research presented here takes changing user requirements as the rationality behind the need for flexible standards. Ribes (2014) extends this view, demonstrating how also changes in the collaborative arrangements among stakeholders and actors involved and in the regulatory frameworks as also generating the need for flexible standards.

The existing literature on standardisation has acknowledged the socio-technical, dynamic and flexible nature of standards and standardisation processes. At the same time, these characteristics have been discussed across a range of different discourses. In the next section, we introduce our concept of fluid standards, a concept we argue to bring these fragmented pieces together and by doing so, capture important changes in the world of standards.

3. A Theory of Fluid Standards – From “Immutable” to “Mutable mobiles”

The primary motivation behind the development and use of ANT has been to enhance our understanding of the relationships between scientific and technological issues on the one hand and social, organizational, political issues on the other. ANT is used to describe the establishment of scientific theories and facts and working technologies as the building of dense socio-technical networks, where elements of various kinds (technologies, humans, institutions, etc. – called actants) are translated (i.e. modified or re-interpreted) and enrolled into aligned actor-networks. Individual actors, whether these are humans, technologies or organizations, are also seen as heterogeneous networks (e.g. Callon 1991). Central to ANT studies is the process by which a scientific theory or technology are made universal, i.e. made to work across 'all' contexts, becoming a universal and purified as pure technology or science free of any social or political attributes. Bruno Latour (1987) name such objects "immutable mobiles" – they are 'objects' that move around in time and space, but they stay the same. A standard, as traditionally understood, is a paradigmatic example of an "immutable mobile." According to Latour (ibid), the making of an immutable mobile is quite an achievement. And it is not only the object in itself that needs to be created. Its context also needs to be constructed in specific ways. This corresponds to a well-known situation within information systems and software engineering: To make one (standardized) piece of software run on all computers, those computers need to be standardized (hardware, OS, etc.). And to make a computer system work, we need electricity, buildings and furniture, and an organization of people with various competencies and roles, etc.

As a part of later developments within Actor Network Theory, the so-called "after ANT movement" (Law and Hassard 1999), it is argued that now the world has become more complex and that most 'objects' (knowledge, technology, practices, etc.) need to be mutable to be mobile. As "mutable mobiles," they transform as they flow from one region to another, but possible without the transformation leading to abrupt changes. Mutable mobiles are fluid; they may go through invariant transformation (Mol and Law 1994). The emergence of this kind of "fluids" is an example of what Zugmunt Bauman (2000) describes as the change towards liquid modernity.

The concept of fluidity was introduced by Mol and Law (1994) in their study of anaemia in Africa and the Netherlands as a social phenomenon in a fluid space. The fluid concept is seen from a topological point of view, as a space, and in particular in contrast to a region and a network. The authors describe an entity by the space it occupies, which in this case (anaemia) is argued to be best described as a fluid. A fluid shares all the basic characteristics of an actor-network - plus some more specific ones, so specific that Mol and Law prefer to go beyond the concept of a network. A network is normally assumed to be composed of a set of discrete entities with links in between. Elements of a fluid are not necessarily discrete. They are so closely related that they cannot be clearly separated.

de Laet and Mol (2000) define a fluid more precisely as having six key characteristics: no clear boundaries; multiple identities; mixtures; robustness; continuity; and dissolving ownership. Possibly the most important and defining characteristic is that the boundaries of a fluid technology are not clear. Boundaries are defined by all that is needed to make the technology work. This leads to the second and closely related characteristic of multiple identities. de Laet and Mol (ibid.) exemplify this by showing how there are many answers to asking the question "What is the Zimbabwe Bush Pump". It is a water pumping device, a hydraulic system, a sanitation device, a health provider, a community builder and a nation builder among others. Each identity has its own boundaries that are defined by what is needed for the technology to work as that identity. The boundaries are different for each identity and change over time. Some identities may be emergent resulting from collective use of the technology reaching a certain level, e.g. nation-building and water infrastructure. Some identities of the technology are defined by elements in its environment and not by its own elements. As a consequence of the multiple identities, the fluid can be said to be robust as it is successful or unsuccessful based on which of its identities is working and not working. It is not clear when it stops acting, achieves its aims, and when it fails and falters. Although in the case of the Bush Pump, some components could be substituted or done without, it is not that kind of robustness which is conveyed. Lots of things can make the pump stop working, but because of the multiple identities, the robustness comes from its multiple purposes, and there is no single weak link that can make all the identities come apart. The strongest link may also dissolve and not be obvious. The fluid is also necessarily continuous. It may have existed before, but not in the same way. When new models come in, old models do not disappear. The fluid technology may be specific and unique but share characteristics with others, a family resemblance, which forms continuity. The fluid technology is also a mixture. It is part of other elements which could be fluids themselves. The mixtures, however, have a need to collaborate with each other if the technology is to work. The collaboration does not have to be rigid and can be flexible and adaptive. Finally, fluid technology has dissolving ownership. The ownership is fluid in itself, allowing the

technology the flexibility to have unclear boundaries and multiple identities. These dimensions are summarized in table 1 below.

So, what can a perspective on *standards as fluids* bring to our discussion on standards? In particular, we will argue that a standard like the CPA has to be mutable to be mobile within the complex, dynamic, rapidly and unpredictably changing world it is a part of. This is contrary to a more ‘conventional’ perspective on standards as the formal, precise, unequivocal output of a formal standardization process, i.e. seeing standards as immutable mobiles. And it is an extension to the current discussion on standards as socio-technical, dynamic and flexible.

Characteristics of Fluid Technologies (Laet and Mol 2000)	
No clear boundaries	Boundaries defined by all that is needed to make the technology work
Multiple identities	Attributed by different people based on constituting or external elements, different boundaries, emergent and changing over time
Mixtures	Of different elements, elements that can be fluid themselves
Robustness	It is not clear when it stops acting, achieves its aims and when it fails and falters: from its multiple purposes and there being no single weak link that can make all the identities come apart. The strongest link may also dissolve and not be obvious.
Continuity	Share characteristics with other technologies, a family resemblance, which form continuity
Dissolving ownership	Fluid in itself allowing the technology the flexibility to have unclear boundaries and multiple identities

Table 1: Summary of the Characteristics of Fluid Technologies

4. Research Methodology

Standards are widely accepted as being of strategic value. Thus standards develop through a process where multiple actors pursue their strategies and agendas. Our research approach is based on an understanding of the processes of standard making as being open and situated as well as being understood differently by the various actors involved. Inspired by Star (1999), our ‘reading’ of how CPA emerged was focused on identifying and analysing different perspectives as well as the more unstructured and invisible work involved. While CPA is usually presented by network operators as their ‘success story’, our approach revealed a highly complex process that was not primarily network operator driven. Further insights were gained into local contingencies, the properties of the standard and the achievements of those engaged in developing the standard.

The collection of data presented here started in 2002 and continued until late 2005. Some additional data are collected later to follow the longer-term evolution of the CPA standard. As we were involved in a larger project studying various attempts of internationalising platforms within one of the Norwegian network operators, the case of CPA seemed to be of particular interest. Early discussions with people working with CPA directed our attention to various properties of CPA and challenges related to its standardisation, implementation and operation. To understand these issues better, one of the authors initiated an in-depth study of the standard. Another author studied how the CPA standard had been internationalized in 4 other countries. Since CPA appeared as inseparable with its context, a case study approach was adopted (Yin 1994), following an interpretative perspective (Klein and Myers 1999; Orlikowski and Baroudi 1991; Walsham 1993;

Walsham 1995). We found our role as researchers to involve describing, interpreting, analysing and understanding the social world of the involved actors (Klein and Myers 1999; Orlikowski and Baroudi 1991).

Starting out by interviewing the manager of CPA within the network operator where we were involved directed our attention to how close the standard was interrelated with other (internal) technical platforms as well as actors within the larger business sector. We also found the appearance of the relationship between the various actors and their coordination interesting, guiding us also to study how CPA was initially conceived and implemented. Thus, to understand the standard, the study reached both back in time towards the predecessors of CPA, out into the business sector as well as out into the more 'global' setting by studying the internationalisation attempts.

A total of 62 formal interviews were conducted with managers, heads of sales and system developers in a total of 34 different organisations, official of government agencies and forums (listed in table 2 below), including the two Norwegian network operators. Interviews were all done face-to-face and involved travel to Malaysia, Hungary and Ukraine. The hierarchical and professional positions of the interviewees are not listed here. The interviews lasted typically 45 minutes to an hour. 39 of the interviews were recorded and transcribed. Notes were always taken, and in the cases where recording was not done, notes and summaries were discussed or sent to the interviewee to obtain his/her feedback to develop a common understanding and assure completeness. The interviews did not follow a strict, but rather an open interview guide focusing on the very nature of CPA, its development and operation. As the interviews progressed, certain issues were also identified and focused on. In addition to the interviews, data was collected from studying documents and specifications, websites and the trade press. In following the internationalization attempts, presentations made and in some cases, email exchanges were also obtained and studied.

Type organisation	No. interviews
Network operator	37
Aggregator	8
Small content provider	7
Integrator	2
Forum/consortia	2
Government	4
Content producers	2
Total	62

Table 2: *Interviews*

While giving a broad understanding of the standard as well as its context, this approach came with certain challenges. Since we did not operate within the borders of one or a few organisations, we had to negotiate access and justify the participation of the interviewees in a variety of different organisations, ranging from 5-men businesses to network operators with 20,000 employees. While this required different approaches to gain access, maintaining access to all these organisations was not feasible. Another challenge was to identify the important actors related to CPA, both historically and related to the business

sector. To access these 'hard-to-reach' populations, a snowball strategy (Vogt 1999) was used.

The data analysis was interpretive and based on our capacity to conceptualise the essential topics in our data. In our analysis, we broadly focused on the industry's market structure, the nature of the services and the standard to include a broad context of influential factors as the actors' aims, institutions and organisations and their strategies. During the transcription of the interviews and detailed study of the notes and supported by other documents and information available, the key themes were identified. The themes subsequently acted as input to discussions and guided the further analysis of the transcripts and notes as well as the topic for new interviews. In parallel with this, the research has been guided by presentations and discussions of our findings at several seminars, workshops and conferences.

5. The CPA case

In this section, we outline the Norwegian CPA solution or infrastructure, then what we see as the CPA standard, its process of establishment and the actors involved. We put a particular emphasis on what we see as distinct with CPA compared to traditional and common standards and standardisation approaches within telecommunications.

5.1 The CPA Infrastructure

The CPA infrastructure basically supports three tasks:

- production, preparation and marketing of content services;
- transportation (requests and deliveries) of services between producers and consumers; and
- handling the involved billing transactions.

The sector offering content services to mobile phones was until 1999 based on the network operators providing separate and different infrastructures (for differentiation purposes) and where they were taking care of all the tasks listed above. The introduction of CPA broke up this vertical integration into functional domains, enabling and requiring a range of new roles and actors. The provision of rather simple services, such as ringtones for mobile phones will in the case of CPA usually involve:

- content producers (composers represented by IPR-brokers);
- content providers (preparing compositions for mobile phones);
- aggregators collecting a wide variety of content and possibly integrating these in larger service concepts;
- media windows (i.e. newspapers, magazines, TV-broadcasters, etc.) providing space for marketing; and
- network operators providing transportation and billing services.

Linked to the core of its business idea, CPA is a joint undertaking by the Norwegian mobile network operators. They provide the same set of functions and a common service level (i.e. secure delivery and level of capacity), and a common user interface for content service consumers. CPA enables the consumers to acquire content services through some simple steps. For example, if a consumer would like to travel with public transport from address A to B in Oslo, she first locates the required information for ordering the service.

Typically, this information is available on the web, in a magazine, but most importantly, close to where it is supposed to be consumed, such as on a poster at a subway station. The information required is basically a short number (four Digit phone number) from where to order the service from and the syntax for the service request. The subscriber requests the content by sending a simple SMS (Short Message Services) from his mobile phone - containing in this case for example "from A to B" to the number 2003 (see step 1 in Figure 1).

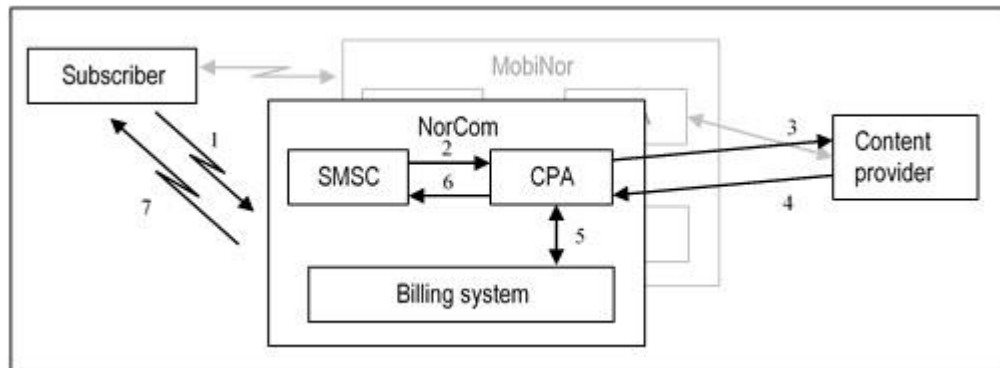


Figure 1: Content Services Transactions on the CPA

A key element of CPA is that service usage is billed over the regular mobile phone bill. Since the consumer is already registered with one of the network operators, there is thus no need for cumbersome registration and confirmation of personal data, credit card number, etc. When the network operator to which the consumer subscribes receives the SMS at its SMSC (message centre), the number 2003 is recognised, and the request, as well as the subscriber' phone number, is sent to the CPA platform (step 2). The CPA platform forwards the request to the appropriate content provider over a TCP/IP connection (step 3).

When the content provider receives the request, they recognise “from A to B”, and produce and return the requested content back to the network operator together with the phone number of the requester. In addition, the content provider also specifies the rating class of the service, i.e. the cost which the consumer is to be charged over the phone bill. It is thus the content provider and not the network operators who specify the cost, according to standardised rating classes ranging from 1 to 60 Norwegian Kroner (NOK) (step 4). The network operator requests their billing system with a CDR (Call Data Record) to handle billing of the request (step 5), and if successful, the content is delivered to the customer by SMS over the SMSC (step 6 and 7). Finally, when the subscriber pays his mobile phone bill, the revenue is split based on a standardised sharing model between the network operator and the content provider. The actual content of these transactions is not approved, monitored or controlled in any way by the network operators. However, it is to their discretion to react to complaints and exclude services they find inappropriate (e.g. involving racism or child pornography) or not following their guidelines. This message flow and the more technical details of the protocols (e.g. error messages) are described in the CPA specifications made openly available by the network operators.

One prominent aspect with the CPA standard is that it is based on the so-called "premium Mobile Terminated (MT) billing."¹ This means that incoming messages that is the request for services are charged as basic SMS messages according to the calling plan of the consumer, while the return message originating from the content provider (step 4 in figure 1) is premium rated, i.e. charges the receiver for more than the cost of a regular SMS. This gives the content providers the possibility and responsibility to charge several times for one request, and thus enables subscription or push services as well as services that are requested from other sources than an SMS, in particular the Internet. For example, based on choosing a certain geographical area or destination, ski-enthusiasts can subscribe to alarm services which are triggered with an SMS whenever there is more than 20 cm fresh snow (so-called "powder-alarm"). Usually, subscribing to such services is for free, but each alert triggered SMS is charged according to a certain rate. Initiating such a service subscription may be based on preferences registered on a large screen PC, rather than using a small screen mobile phone or SMS.

As owners of the underlying mobile telecommunication infrastructures, including the billing systems, the network operators were central actors in the establishment of the CPA standard. But their efforts after it came into operation have been modest and catered primarily to increasing traffic. At the same time, several application houses are active in building add-ons to the underlying infrastructure to enable new services and service concepts. Examples include software to collect votes, produce and visually present numbers and statistics on ballots in relation to TV-shows, as well as software which presents on-screen comments and questions posted by SMS to discussions/talk-shows.

5.2 The Standardization Process

We will now describe the standardization process, i.e. the design, implementation and adoption of the CPA standard. While focusing on the efforts of the two (later three) Norwegian mobile network operators, we will also show the crucial importance of other actors in this process. The standardization can be split into two major steps: the first was through experimentation reaching consensus about an open approach; the second covered definition, implementation, diffusion and use of the standard. The overall strategy was very opportunistic: the focus was on offering useful services to the content providers at the lowest possible costs. A consequence of this was a focus on building on existing installed base as much as possible and to avoid developing new technological components.

In 1997, both of the Norwegian mobile network operators launched independent platforms for the provision of content services. These services were not considered by the operators as being of strategic importance, and they thus refrained from any substantial investments. The platforms were instead based on the efforts of a few internal enthusiasts strongly inspired by the current development of the World Wide Web. They wanted to create the mobile Internet and a marketplace in everyone's pocket based on the mobile

¹ Billing occurs either when a subscriber sends (originates) a text message to request a service, Mobile Originated or MO billing, or when a subscriber receives services on their phone, Mobile Terminated or MT billing. The kind of subscription-based services described here requires MT billing. Billing strategy is normally an important strategic decision for mobile phone operators. Most billing systems are based on just one of these strategies and changing from one to the other is a task of enormous costs which implies that these services will normally only be provided over infrastructures which are based on MT billing. The crucial role played by billing systems was expressed in the very first statement of our first interviewee. "What kind of services you can provide is totally determined by the billing system."

phone. This resource-situation, combined with an ad hoc approach of a few enthusiasts rapidly generating new services, led to the underlying platforms being developed in an unstructured fashion and outside the strict systematization regime of the network operators. Over these platforms, the operators offered exclusive content and utility-based SMS services to their respective subscribers – in a conventional fashion like more or less all operators around the world were doing. With these exclusive offers, operators could differentiate and by that (at least assumingly) strengthen the brand value and increase customer attractiveness and loyalty. So, the most crucial precondition for establishing an open standard was actually that the operators abandoned this approach.

The services offered by these closed platforms were typically news, stock quotes, weather forecasts and yellow pages. All in all, it was only simple information services. The service pricing was set regardless of the content and charged simply on a per transaction basis and as regular SMS – there were no possibilities for premium rating. While this made the services cheap for consumers (NOK 3) it offered no, if any, possibilities for generating direct profits for the involved actors. The network operators' pursuit of exclusive services further inhibited and limited the richness of the services offered (only utility services) as they were related to the operators' brand. The market did not respond positively to this approach, not much traffic was generated, and no further service development and innovation were spurred.

In spite of the limited success of the services, some enthusiasts in the content industry and within the network operators, persistently believed and argued that mobile content services had a potential. During fall 1999, one of these 'entrepreneurs', a former employee of one of the network operators, returned to the operator after working for a TV broadcaster for a few years. Based on his experience with the existing SMS services from his work at the TV broadcaster, combined with his contacts with other content providers and knowledge about what they needed, he had a vision about how to approach mobile content services. Upon his return, he started pursuing a more open and dynamic approach where content providers were enabled by the operators to create and sell content services freely. Along with the other content providers, he argued that what was needed was a platform where the content providers freely and rapidly could introduce new services and change existing ones. Only content providers had sufficient knowledge of the market and the will and guts to invest and innovate. As he started to persuade the operator to open up their interface, other content providers also approached both network operators with similar ideas. However, the network operators (at managerial levels) were difficult to deal with, and did for example not take suggestions such as to charge 5 and 10 NOK for content services seriously, but where rather laughing, as commented by a product developer from one of the TV broadcasters:

“So, we felt for a long time like banging our heads to the door there, and this was not because of technical issues, because that was the next thing, then one had to build that in addition. The problem was that they simply did not believe that it was possible to create revenues from it [content services]”

On the basis of these initiatives from the content providers, the lack of success with the previous platforms, high cost for marketing, fundamental concerns related to linking their brand to non-utility services as well as the pricing possibilities (no premium rating), the network operators, again represented by the few enthusiastic and persistent individuals,

took new initiatives. The management efforts and the investment in the further implementation of what was becoming the CPA were, again, limited. However, the enthusiastic individuals managed to find some space for action even if this was more in conflict with than supported by existing strategies - as noted by the 'lead enthusiast' in the CPA 'project' within one of the network operators:

"It was a bit of entrepreneurship spirited, the project; because we had no resources assigned like you are used to in a big company. So we had to make everything ourselves, and find the resources ourselves, in the form of a project. And this resulted in, that the atmosphere, both market-wise and business-wise and the technical development, was entrepreneur directed."

After trying for months, the first content provider finally got access to the CPA platform of one of the network operators in fall 2000. The CPA platform was at this point only based on minor technical changes in the existing SMS service platform, and it was clear that the platform was premature and still controversial for network operators, as noted by the manager of a content provider:

"And then they had something running ... and suddenly I showed up, but they had not planned to launch at this early stage. And they had to sort out, what do we do now? And that is difficult in this kind of organisation. So, finally, by being persistent, I could plug into the platform, but it was made clear that the billing could fail to function at any time and without any rights for me to claim compensation ... John² [an employee a network operator] meant a lot for this, he did a lot that he was not allowed to by his manager. He pushed this through internally, in a way that he possibly would not if he were a devoted and nervous guy. So he was scolded a lot in the beginning."

Despite its flaws and 'hacked' nature of the platform, it served its new purpose. Soon, the other operator had its platform running, and other content providers followed, and the traffic and revenues surpassed the previous platforms in only a few months.

To develop the CPA standard, negotiation and coordination were also initiated among the network operators. The coordination focused on sorting out issues such as the usage of common short numbers to attract large media actors. In addition, common price intervals (rating classes) were introduced to enable marketing one number and one price for each service across the market. In this coordination process, the need for a standard, at least related to the service level, was identified. The network operators were also focused on avoiding the development of interfaces that were too different towards the content providers. While a certain difference in the interfaces could be an advantage for the operators since it would make it less attractive for small content providers to connect directly to CPA (with increasing administrative costs), too much difference could lead to only one, strong aggregator controlling the content market, which should be avoided.

5.3 The "Transfer" of CPA to Other Countries

One of the Norwegian operators, NorTel, eventually considered the CPA a "best practice" towards addressing the mobile content market. In order to achieve synergies and economies of scale across all its subsidiaries, NorTel embarked on a program aiming at

² Not the actual name

establishing standards across all mobile operations by identifying and transferring such "best practices." From 2001 it launched attempts to establish the CPA standard as one such standard across all its affiliates. They started trying to transfer CPA to Malaysia, Hungary, Thailand and Ukraine more or less in parallel. To succeed with the establishment of CPA as a standard for all affiliates, however, NorTel also had to succeed in making CPA a national standard in the countries where their affiliates operated. And the whole effort included three main steps in each country – just like in Norway: first convincing the management in the affiliates to go for an "open garden" strategy, then the other operators, and finally implement the standard and bring content providers on board. We will here describe the process of transferring CPA to Malaysia and Hungary.

5.3.1 Malaysia

In 2001, Malaysia had 5 mobile operators, out of which the NorTel affiliate MalayCom was the 3rd largest in terms of subscribers. At the time, all operators were selling mobile content under their own brand (just like in Norway before CPA).

In mid-2001, NorTel brought in one of their senior managers to be the new Marketing Director (MD) in MalayCom. He had previously worked with CPA in Norway and knew CPA to be successful. In September 2001, with the support of the MD, two members of the Norwegian NorTel CPA team travelled to MalayCom to describe the CPA system - including its success in terms of revenue generation. As a result, in October 2001, the MalayCom MD established a small team made up of the managers from Product Development and Mobile VAS (Value Added Services). They were given the task of revamping MalayCom's mobile content business. Although they were aware of the details of the CPA, and they did incorporate ideas from it, they developed what they felt was relevant for MalayCom in their local context. As work progressed and more people got involved, there was some debate on the basic idea of opening up the value chain to external parties by offering a revenue-sharing model. The conventional idea of MalayCom doing its mobile content business largely by itself still remained strong. But the MD championing the new ideas inspired by CPA had the support of the CEO (also a NorTel expatriate). The two MalayCom managers could also show that some of the shortcomings and risks related to the current approach could be solved with a CPA standard. Those shortcomings included MalayCom's limited advertising and promotions budget for mobile content. In addition, MalayCom were unable to work with content providers with content they knew could generate revenue but weren't sure if they wished to associate with the MalayCom brand.

In the meantime, a NorTel Project Manager who had worked on the CPA in Norway arrived in Oct 2001 to assist with the CPA project. He knew the MD and that MalayCom was on the move towards the CPA system. As his girlfriend was being sent to MalayCom for a period, he contacted the MD to ask if there was an opportunity for him to work on the CPA project in MalayCom. The MD decided to give him a six-month contract. Although there were no specific requests from the MalayCom's CPA project to have this Project Manager working at MalayCom, they supported the Marketing Director's decision to do so. As one manager said:

"We were actually quite happy to have somebody who had the right experience to come and assist us because at that time most of the stuff that we were talking about we were actually just based on what they (the NorTel managers doing the

first presentation) sent us, basically the presentations on how the market grew for CPA from present to NorTel's value-added services revenue and what did not. We were pretty much working from that viewpoint but to have somebody who had been there and done that would make it a lot easier especially when talking to the other operators because this was a person who could give immediate feedback.”

The NorTel Project Manager worked closely with a team of local managers. Based on the overall specification of CPA, the team worked out specifications for how to implement CPA on top of MalayCom's billing system and SMSC and invited proposals from a number of software solution providers. The Project Manager provided knowledge of NorTel's CPA platform in developing the specifications. He also got statistics on usage and queue handling from Norway. On the commercial side, MalayCom used NorTel's agreement for content providers. MalayCom's legal personnel adapted it for local laws and practices. At the same time, MalayCom's CEO brought up the CPA system and cooperation on short numbers at the monthly CEO meeting among mobile operators at the MCMC (Malaysian Communications and Multimedia Commission). This made it easier for MalayCom to call for the first 'CPA meeting' with all the operators later that same month. Before the meeting took place, however, all the operators were invited for a meeting by one of the local television stations, TV3. The meeting consisted largely of a presentation by a Malaysian wireless technology company called Howtraffic. The previous year, at a conference in the US the CEO of Howtraffic met John Strand from Strand Consulting in Denmark who described the trends of the Scandinavian markets in general and the role of SMS as a tool for interactive TV in particular. Howtraffic worked with TV3 to provide technical solutions for programs that required interaction with the viewers (e.g. voting). In particular, they were challenged by the lack of coordination among the operators. Presenting 5 different short numbers, and sometimes different prices, made TV-interactivity unnecessarily cumbersome. TV3 wanted to change this and called for the meeting with the operators on behalf of Howtraffic.

The TV3/Howtraffic meeting added momentum to the meeting called by MalayCom. MalayCom presented the CPA system and its success in Norway, the advantage of this system to the mobile operators and content providers. TV3 and Howtraffic were presented as 'a real life example' showing how common short codes and standard charges would make advertisements clearer and easier for the TV station, content provider and consumers. The meeting ended with a plan to meet again where the other mobile operators would give their feedback or other proposals on what was discussed.

A second meeting was held in February 2002. Another operator, Maxis, presented their thoughts in the form of three possible systems. All three systems required cooperation on short numbers and prices. Two of the options placed one operator or a 3rd part company in a controlling and coordinating role. The 3rd option, which was the same as MalayCom's proposal placed all the operators in the same non-controlling position. In this way, there would be little or no overall control. Since none of the operators really wanted to see any other operator in a controlling position; they agreed that no or little control was the better option.

Despite opinions to the contrary, MalayCom pushed for keeping the maximum value at RM 10 and for the short numbers to be 4 digits (as it was in Norway). A discussion on

email followed on the number of digits. One of the other operators felt that 4 digits were too small as the first two digits were to indicate the operator whereas MalayCom felt that 4 digits would be much easier to remember. The other operators supported 5 Digits, so MalayCom gave up on the 4 digit position. Each operator would manage a number series according to its prefix (Celcom (019) – 39xxx, MalayCom (016) – 36xxx, Maxis (012) – 32xxx, Time (017) – 37xxx and TMTouch (013) – 33xxx). The operators would let each other know which number they had assigned to a content provider so it could have that same number with all the operators.

A 3rd meeting was held in April 2002, where the short code system was confirmed. Each operator would decide independently on setup, access and maintenance fees and disclose these amounts among the operators so that there would not be too large differences. Twenty-one tariff categories from RM 0.30 to RM 10.00 were also finalized. The proposal to Malaysian Communications and Multimedia Commission (MCMC) was sent in July 2002. The operator TMTouch pulled out of the discussion at this stage and was not one of the signatories in the MCMC proposal. TMTouch however subsequently cooperated with the other operators on what was agreed.

The operators' interfaces to content providers were all based on the functional specification provided by NorTel. The detailed implementations were all based on TCP/IP. Unlike in Norway, the operators were happy to let the content providers integrate their system with the CPA platform themselves. This normally required a couple of days' work for the most competent content providers and up to a couple of weeks for the less competent ones. A few integrators did the work for the content providers without the required technical competence. Within two years the mobile content business was flourishing in Malaysia. And the transfer of the CPA to Malaysia was found to be the most successful best practice transfer ever accomplished by NorTel (Alphonse, 2007).

5.3.2 HunCom in Hungary

In 2002, the Hungarian NorTel subsidiary HunCom was the 2nd biggest out of three mobile operators. During the 90ies, HunCom offered through some content providers various premium rate services using IVR (Interactive Voice Response) – mostly services related to the sex industry. In the late 90ies, HunCom started selling logos and later ringtones through SMS. HunCom bought this content from external content providers and re-sold them under the HunCom brand. HunCom did not consider this a business to be one that could generate revenue - just useful for fairs and promotions. By 2000, the growth in person-to-person SMS triggered a focus on SMS also as a delivery channel for premium rated services. HunCom's NorTel expatriate CEO was knowledgeable of the success of CPA in Norway and saw its potential.

For HunCom, a big problem with premium rated IVR was a fraud. With IVR, HunCom's subscribers would be directed through inter-connect to fixed lines and then to the content providers. This involved a range of parties, limited control and higher costs. With SMS, however, the content provider would have a direct connection with HunCom's message handling and billing platform and accordingly come under a direct and more controllable relationship with HunCom.

Most of HunCom's management – in the same manner as MalayCom's - was sceptical about allowing 3rd parties to run the content business. But, HunCom's NorTel expatriate

CEO saw the virtue of creating a cooperative environment among the mobile operators in order for the external content providers to thrive and drive this market. He convinced the other managers to support a decision to go for an “open garden” approach. At levels further down in the organization, the NorTel managers in-charge of CPA made presentations to the HunCom managers in-charge of mobile content to show the success of the CPA in markets like Norway and Malaysia.

At that time, the CEO's of the Hungarian mobile operators met 2-3 times a year to discuss common issues. HunCom's CEO used this forum to try to convince the largest operator Westel (a subsidiary of T-mobile) CEO to cooperate on opening the market. This involved following key aspects of the Norwegian CPA model. The Westel CEO was initially sceptical to the ideas but started to move in this direction after some months.

In 2001, NorTel's country office in Hungary started a company called Digitania to help HunCom develop the market for premium rate SMS. They used the technical platform and resources of another NorTel company (NorTel Link, Norway) that had developed the CPA platform for NorTel in Norway. And in 2001, HunCom was the first mobile operator to introduce premium rated SMS by third parties in Hungary. The third-party content providers were made up by companies selling premium rate voice. The TV show "Big Brother" was later screened by TV2 in Hungary and offered SMS voting, giving the Hungarian premium rate SMS market a boost.

HunCom adopted NorTel's agreements with content providers using CPA. As a result of the concern for fraud, however, HunCom initially decided that Premium rate SMS services could only be used based on a pre-paid scheme. Therefore, post-paid subscribers would first have to purchase pre-paid units before being able to use the services.

The access numbers for premium rate SMS services consists of 10 Digits – primarily due to the requirements set by the regulatory authorities. The system originated from the access code number system for premium rate voice calls. The format and what they denote is given in table 3 below.

Long distance	Premium rate	Operator code	Price code	Content provider code
06	90	XX	X	XXX

Table 3: Access Code Format

The long-distance and premium rate codes are fixed. The operator codes are 62 for HunCom, 63 for the two other operators T-mobile and 67 for Vodafone. A combination of operator code and the Price code identify a particular price. Therefore, content providers need a different access number for different prices. The final three digits are the content provider code.

There was no cooperation among the operators on access codes, and Westel argued that they wanted their subscribers to know that a particular service was coming from them by seeing the '3' in the access number. Even when the operators were using premium rate SMS to collect donations for people affected by a big flood in Hungary, the operators could not agree on a common access number. Later, as a result of strong pressure from the content providers, however, the regulatory authorities allowed some 4 Digit number series to be used as access codes for premium rate SMS services. This change, together

with the introduction of number portability made the operators start coordinating the use of short numbers.

HunCom attended the CPA workshop organised by NorTel in 2002 and met NorTel affiliates from Asia and Europe. HunCom's practice of not allowing post-paid subscribers' credit for premium rate SMS services was strongly questioned. This resulted in HunCom re-examining this policy and later in 2002 allowing post-paid customers a credit of 2000 HUF for premium rate SMS. This had a 'good effect', and in 2004 this was increased to 6000 HUF. In early 2003, HunCom also developed a more standardized and transparent revenue share agreement with the content providers, based on the revenue share depending on the volume generated.

5.3.3 Summary

CPA was successfully transferred to Malaysia and Hungary (as well as to a number of other countries). However, the speed of the transfer varied. The process was fastest and smoothest in Malaysia. Comparing Malaysia to Hungary, we see that the pressure from a larger and more mature content provider industry and more friendly relations among the operators contributed to this. But also accidental conditions, like the fact that the Norwegian CPA project manager asked for a position within MalayCom because his girlfriend worked there made important competence for successful CPA implementation available. Further, a number of contextual issues like national regulation, the presence of fraud, existing services in use (like IVR) have a significant impact on how much the standard must be adapted and how fast and smooth it is implemented and adopted.

6. Analysis

In this section, we discuss CPA from a standardization perspective. The conventional view on standards is to see them as a set of detailed technical specifications – approved by a formal standardization body or an industry consortium. Compatibility standards like tele- and computer communication standards are primarily seen as interface specifications. Communication standards typically define communication protocols and the formats of data to be transferred. Such standards also define, implicitly or explicitly, the overall functionality and architecture of the communication system or infrastructure the standards relate to. Our understanding of the CPA standard deviates from this perspective, and we will, in this section, analyze the CPA case from this point of view.

6.1 *The CPA Standard*

While being interrelated with a range of technical standards such as GSM and SMS, the CPA standard is partly specified in technical documents, but also on more flexible, loose and informal agreements which are necessary to coordinate the various actors' efforts. This standard has emerged as an outcome of the interaction between the involved actors over time, and thus as a *de facto* standard. Its details are indeed documented, but not specified in a coherent set of documents. However, it does play the role of traditional compatibility standards, and it confirms to Spivak and Brenner's (2001, p. 16) definition: "A standard defines a uniform set of measures, agreements, conditions, or specifications between parties (buyer-user, manufacturer-user, government-industry, or government-governed, etc.)" that Lyytinen and King's (2006) used in the Special Issue of MIS Quarterly on Standard Making they edited. And what we here consider the CPA standard to be is more than just technical specifications – it is rather a "standardised package" (Fujimura 1992) that includes a range of necessary components of very different kinds.

The package the 'parties involved' arrived at in the case of the CPA includes the following five core components:

- *Business model and revenue sharing model*
CPA is based on the network operators providing a standardised business model for premium rated content services to the content providers. The business model is called 'open garden', implying that the network operators allow any content provider to distribute their content to all subscribers, a model that offers content providers public market access as well as economies of scale in billing. Thus, the CPA is not used by the different operators to offer content exclusively to their customers for differentiation purposes. This is based on a revenue-sharing model, and predefined rating classes (maximum charge is 60 NOK (approx. 8.50€)) and predefined revenue split favouring the network operator from 54 to 29 % depending on the rating class. The rating classes and revenue split model are non-negotiable and available online for the content providers.
- *Equivalent functionality, architecture and service level for content providers*
The different network operators offered the content providers the same functionally and service level, even if the interfaces to the network operators' implementation of CPA platforms differ. The service level provided by the network operators is standardised in the sense that the infrastructure of each of the network operators can take care of general services as well as the typical traffic peaks. And the services are provided by means of an infrastructure based on a common architecture involving, e.g. the billing system of the operators. This infrastructure is, however, implemented differently by the different network operators. While one uses the CIMD protocol, which is a subset of Nokia's CIMD2 with additional operator-specific parameters, the other has implemented a SonicMQ client API for the content providers. The content providers are thus required to implement a TCP/IP interface, as well as a Java-client, alternatively a C-client. Both interfaces are based on content providers initiating a TCP/IP connection to the respective CPA platforms. The basic transactions are service requests originating from the subscriber, messages containing the services originating from the content provider, as well as acknowledge/error messages from the CPA platform to the content providers. At the same time, companies acting as integrators provide interfaces which hide the differences between the operators' implementations of CPA for the majority of the content providers. This reduces time-to-market and the necessity of substantial up-front investments to connect to CPA. Further, it also lessens the administrative burden of network operators as smaller content providers find it appropriate to connect indirectly through the aggregators.
- *Administration and use of rating classes and short numbers*
Based on their 'open garden' approach, network operators have also standardised their administration and use of short numbers and rating classes. The rating classes are non-negotiable and publicly available. This adds to the transparency of the market by being the basis for a standardised way of marketing the services.
- *Guidelines for consumer protection*
In order to reduce the risk of 'offensive' services being provided or marketed fallaciously, the network operators have together with The Consumer

Ombudsman standardised guidelines describing which services cannot be provided over CPA as well as how to market the services in a consumer-friendly manner.

- *Interface for service acquisition*

By providing a standardised interface for service acquisition – the user interface, every mobile phone user in Norway has easy and transparent access to content services. Independent of which operator they subscribe to as well as the type of subscription and calling plan, subscribers can access the same services, from the same short number and for the same price. This also makes the marketing of services simpler for the content providers and thus easier for consumers to read and understand.

These different components do together compose a standard that supports an open and two-sided CPA market. Based on the standard, new content providers can easily enter the market and communicate with consumers with simple messages. In this market, content providers can market, sell and provide their services without even considering to which network operator the consumer subscribes, based on the standardisation of the business model, the revenue sharing, rating classes, short codes, functionality, architecture and service level. Together with a standardised administration of rating classes and short numbers, this also simplifies and reduces the start-up costs for content providers when connecting with the different network operators. On the consumer side, everyone has access to all content, without any restrictions or special instructions from their operator. Consumers can also expect to be treated fairly by the content providers, and if not, the network operators will handle any misconduct or misunderstandings in a similar fashion.

Even if not specified in a coherent set of documents, the CPA standard is documented. All the network operators have their own websites where existing and potential content providers can register and get the package of information needed. For example, the largest network operator presents CPA related information openly on their portal. Here, the different API's are introduced and described with a standard agreement document with, e.g. a standard revenue-sharing model, a protocol specification and how to get started guide, CPA Guidelines (written by the Norwegian Consumer Ombudsman) and a CPA agreement front page template. The second-largest operator presents in a similar way a standard agreement document, the CPA Guidelines and a short functional description. They require registration to enter their CPA portal with more information. Thus, content providers have access to a set of documents from each of the operators describing consumer guidelines, interface and functional specifications, revenue sharing model with rating classes and the procedure of allocating short numbers.

6.2 *The Standardization Process*

We will now describe the process leading to an agreement about each of the components of the CPA standard "package". First, the common Interface for service acquisition came as a result of the high cost of advertising and approaching only one fragment of the market. A common approach towards the consumers would increase the ease and reduced the cost of advertising and make it more straight forward for the users to acquire services. Already before the CPA, the network operators took advantage of this approach by using the same acquisition procedures and basically providing the same services. Second, a common business and revenue sharing model rendered possible the content service

business, as well as strengthened the operators' power towards the content providers. For example, whenever content providers have tried to negotiate revenue shares with the operators, the content providers have experienced the operators acting as well coordinated. The operators offer standardized and open contracts available on the web for content providers. At the same time, this common approach has reduced administrative burdens. Third, equivalent functionality, architecture and service level for content providers have lowered the threshold for content providers to connect to the CPA platforms and further enabled new service concepts. In particular, as new service concepts have emerged, the CPA platforms have changed from being mere extensions of the previous platforms that were put together rapidly and ad hoc to well-integrated, tested and documented platforms with proper queuing and fault handling mechanisms. Fourth, and partly covered above, administration and use of rating classes and short numbers, has been important to enable a common interface for acquisition. Coordinating short numbers implies that whenever a content provider approaches one of the network operators to acquire a new short number, the network operator make a phone call to reserve this number also with his peers in the other operator. Fifth, guidelines for consumer protection have from day one been important to avoid negative attention. In general, the industry has managed to have a low profile. Such guidelines have only over time been formally agreed upon by the operators, primarily due to the industry growing larger and the attention from media as well as the national consumer council increasing.

Bearing in mind the limitations of the earlier attempts of the operators to offer content exclusively to own customers (or 'walled garden' approaches); there is consent in the Norwegian market that the CPA standard was crucial for this industry. While the initiatives behind introducing the standard to a large extent originated from outside the operators, the very shape of the standard was at the same time defined by the network operators more or less on their own. For example, the revenue model has been a contagious matter between network operators and the rest of the industry. This tension is intensified by the lack of initiative and resources put into developing CPA further by the network operators. While the division of roles and responsibilities is seen as appropriate, this is not reflected in the distribution of burdens and benefits. Defining the shape of the CPA standard, the constellation of network operators has also created a duopoly situation in the sense that the revenue share models are non-negotiable and there are no alternative equivalent channels for content services.

To summarise, the developers and the promoters of CPA were operating with scarce resources but were equipped with the ability to pursue what they called a 'non-telecommunication' like approach. More particularly, they avoided the need for a strong and convincing 'business case', the costs of the usual grand marketing campaigns of the network operators, the need to cumbersome change the billing system and they managed to postpone technical systematisation and documentation. The standardization, as well as its implementation, was carried out in a bottom-up fashion were a few enthusiasts, working for the operators, and a couple of content providers, set up a pilot version of the infrastructure and a few pilot services using it. The successful demonstration of these attracted more content providers and other actors. As the use of the infrastructure expanded, it was polished and extended and so was the standard defining it (more on this in the next section). Rather than a traditional telecommunication standardization model, i.e. a formal top-down process focusing on formal and detailed

technical specifications, the standardization model was more driven by "rough consensus and running code" – i.e. in line with the slogan describing the Internet standardization approach. While the network operators implemented technical CPA platforms, content providers were similarly important in their persistent belief and pursuit for its realisation. In this process, aggregators found their role in providing support for smaller content providers where the standard did not suffice. In addition, and perhaps more important, they developed and introduced add-ons and extensions to the platform, enabling new services and service concepts. At least partially resulting from these circumstances, the cost of implementing and operating CPA platforms became marginal for the network operators compared to earlier and alternative approaches. The costs and further the risks involved are now primarily resting with the content providers.

6.3 The standardisation bodies

We will now turn to the organisation of the standardisation process: which actors were involved and what kind of 'standardisation bodies' they established to help coordinate the work. We use here the term 'standardisation body', but it is worth noting that none of those we will mention here were of the traditional kind with formal rules and formally established working groups, etc.

The Norwegian mobile telecommunication market has always been relatively tidy and was at the turn of the century basically composed of two network operators (later three) and approximately 20 mobile virtual network operators (MVNOs). In turnover, the operators have respectively 55 and 29 % of the market. With CPA, the industry was much more complex and involved a range of different roles and actors, as illustrated in Table 4 below. The main activities related to CPA involved approximately 180 different companies and 250 employees in 2005. Since 2006, this industry has generated a yearly turnover of more than 2 billion NOK.

The role of aggregators is to collect content from a variety of content providers and provide it in the market. Managing the relationships and interfaces with the network operators, aggregators decrease the time to market and leverage the up-front costs for small content providers (each network operator demand a 100.000 NOK connection fee). Media windows are departments of media houses and TV-broadcasters which offer marketing space for content providers and aggregators. Application houses and integrators specialise in developing gateways to the network operators as well as new service concepts. Finally, the content providers are producing (from scratch or based on others' content) and providing the content services.

Type of actors	Number of
Network operators	2 (later 3)
Aggregators (large)	5
Media windows	6
Application houses and integrators	14
Content providers	153

Table 4: Actors involved in the Norwegian CPA market in 2005

To coordinate between the different actors in the case of CPA, several bodies have emerged over time. Coordination is primarily on-going between the network operators and the content providers as well as between these groups.

The development and establishment of the CPA did not involve any traditional standardization organisations. In one way, several activities were coordinated by the market. But institutional structures beyond the market did play important roles as most of the discussions were taking place through informal networks. This was possible because the number of people involved was limited and people knew each other rather well. Relationships had developed through collaboration and because people moved around among the organisations. For example, several of those who initially developed CPA are now working for application houses and integrators as well as being managers of the aggregators. Another example is the one who initiated the development of CPA within one of the network operators, who did that explicitly based on experiences from working with a content provider and media window. This person did later become head of one of the application houses. The first version of the CPA was developed by a few individuals within the network operators after a handful of key people had agreed upon the approach. On the one hand, they agreed to follow this approach because of extensive knowledge about the needs of the content providers due to own experiences in the content industry as well as inputs from pro-active and persistent content providers. On the other hand, they also knew that management would not allocate resources to do anything more technically sophisticated.

After the development of the first version of the platform, most standardisation work has been organised as ad hoc projects going across various organisations and types of actors. Most projects have been initiated by content providers that needed new functionality. They have approached aggregators and discussed the detailed specifications of the new functions and how to implement them. And in most cases, the aggregators have implemented and added new functionalities to the 'ends' of the platform, i.e. the parts operated by the content providers themselves. But in some cases, the new functions have required extensions to the platforms operated by the network operators. This happened, for instance, when the service levels had to be improved to handle traffic peaks related to TV-shows such as "Big Brother" and "Idol" as well as the introduction of MMS services. In these cases, aggregators have pursued separate discussions with the two operators to initiate improvements in the platforms.

Most actors have been represented in the organisation 'Teleforum'. Within the framework of this organisation the actors have agreed upon a set of rules for consumer protection related to CPA, for instance, what kind of content they should not allow, and treatment of customers including dealing with customers complaints. The main motivation behind the way this forum works is the fact that all actors agreed early to act cautiously so that the public authorities did not see any need for more formal regulation of this sector. They believed that such formal regulation would make things more difficult and slow down its growth and development. The content providers have also established an organisation called 'Innholdsnett'. Within this organisation, they discuss various issues of shared interest. This includes discussions to help understand the market, the architecture of CPA and the possibilities within the overall CPA framework. Both 'Teleforum' and 'Innholdsnett' have thus played a role in the development of the CPA standard.

7. Discussion

In this section, we discuss the CPA standard and how its development was facilitated by its specific characteristics which made it as flexible as its dynamics required. We continue by discussing and conceptualizing the CPA as a fluid standard.

7.1 The dynamics of CPA

The dynamics of CPA followed the cyclic (recursive) model proposed by Botzem and Dobusch (2012), where the CPA is modified in each cycle. And it is modified in terms of extensions in Egyedi and Blind's (2008) vocabulary. The series of modification cycles also fit Fomin et al.'s (2003) process model of standardization, which sees development and diffusion of standards as integrated and overlapping and constituted by the integration of sense-making, design and negotiation. Indeed this model captures very well the processes leading up to acceptance and initial specification of the CPA in each country. But also the later extensions and modifications of the standard were taking place in line with this model. Lastly, the history of the CPA standard is in line with van den Ende et al.'s (2012) argument that the more flexible a standard is, the more easily it is adopted. This flexibility is well illustrated by the way the CPA standard was modified and extended to support the functionality required and the handling of the volume of voting during popular TV shows and the modifications done to make it fit national contexts when transferred to other countries.

We will now discuss the specific characteristics of the CPA standard that made it flexible and which, in our view, contributed significantly to its success. We will first discuss what made the standardization process successful in the sense that a standard was defined and implemented in a timely manner. Then, we will discuss specific characteristics of the standard in itself that we see as important for its success.

7.2 The success of the CPA standard in Norway

The first factor contributing to the success of CPA we will highlight is the relatively small community of individuals involved in the mobile content service business segment at the time the CPA emerged. The importance of communities in standardization is well established in, for example, Telecommunications (Lyytinen and Fomin 2002; Keil, 2002). In Norway, CPA emerged from a community of mobile operators, content providers and supporting businesses that were known to each other. Individuals in these organizations knew each other very well, they had been working for different companies and kinds of companies, and many of them had previously worked for the operators. The members of this community had a shared understanding of how the different kinds of actors were thinking and what needs they had. Shared ideas related to mobile services had been developed, and in particular the idea that they should be implemented on top of an open platform.

A second important factor is the fact that the largest operator NorTel decided not to invest in this area. If they had done so initially, we believe that would have preferred a closed proprietary platform like the Japanese i-Mode and in line with what most operators making investments in this area have done. This also implies that NorTel participated in this domain and in the community as a small unit including, by and large, just a few individuals and not as the big corporation it really is. This means that NorTel, in many ways, was just an ordinary member of the community of small companies.

The successful development and implementation of the CPA standard also depended on the approach followed, which can be characterized as bottom-up and experimental or as evolutionary and learning-oriented. First, the simplest possible pilot version was developed and tried out. The platform was then extended and improved as new needs emerged. This simple platform made it easy to try out new services which is exactly what is required in an environment, or emerging market, like the one of mobile content services. This kind of bottom-up and experimental standardization also requires specific organizational structures. The organizational structures need to be simple, flexible and dynamic. And the informal and project-oriented – or ad hoc – organization of the activities fit those requirements well.

The success of the CPA standard in Norway was also dependent on what we see as its key (partly overlapping) characteristics: openness, completeness, simplicity, informality, flexibility, and robustness:

- **Open**
Not only can anybody connect to the platform, but they can also extend it by adding new functions at the ends. At the same time, the standardization process has been open for those with the initiative to participate.
- **Complete**
It covered all the aspects that the actors needed to agree on. It included the mere technical issues such as the overall functionality and the service level of the network operators' platforms. But just as important, it was a mixture that also included the business model, aspects related to marketing, use of short numbers, rating classes, rules of conduct, quality of service, the management of short number (including procedures for how the operators should inform each other), etc. And implicitly, the standard also defined roles for the various actors, such as the aggregators and integrators.
- **Simple**
Only the minimum of functionality was included. This means that it was easy to understand and to use or implement, and it was cheap and easy to provide new services based on it. Further, the standard's simplicity made it easy to change when new requirements were revealed.
- **Informal**
Only a few of its features are specified in detail. Further, there was no coherent set of documents that were defined as the official specification of the standard. And also the rules for organizing of the standardization activities or approval of the standards were informal. This characteristic is the opposite of what is commonly seen as a crucial requirement of a standard which says that its technical specifications should be complete and in full detail at the same time as there are clear rules for the organizing standardization activities. In the CPA case, this informal character was not seen as an anomaly, but as an important feature that was taken advantage of. Some problems a technically complete standard is supposed to solve are in the CPA case often solved by organisational means rather than technological ones. This has been an advantage because specifying a technically complete standard would require lots of hard work which again would demand resources which were not available. This work would be organizationally complex because of the heterogeneity of the actors' involved (small and big ones,

new and old, rich and poor, coming for various business sectors, etc.), and in particular, the competition and rivalry between the network operators, would make it hard for them to agree upon a detailed specification. In addition, there are uneven interest and capacities to invest in new infrastructure by the different stakeholders. A more formally specified standard would normally be expected to solve anticipated future needs. What the future needs are in this area is incredibly hard to predict. Different actors would have very different ideas about that, and accordingly, they would have very different ideas about what the requirements for a standard should be, and accordingly how to meet them. A more detailed standard would be more complex and expensive to implement not even considering changing it. Accordingly, it would not enable innovation in the same way as a more informal one.

- Flexible

The open, simple and informal character of the CPA standard made the standard *flexible*. Flexibility is of utmost importance in an unpredictable and rapidly changing environment like that of mobile services.

- Robust

This flexibility also made the standard *robust*. It is robust in the sense that when new requirements emerge, the overall infrastructure can be accommodated to them in several ways. New functionality can be provided by enhancing the basic platform by the network operators or be added to the 'middleware' provided by the integrators and aggregators, or it may be implemented by the content providers. It is thus also robust in the sense that modifications can be done by different actors. This means that the modifications and the work can be done where and by those best suited and most committed. The network operators are hesitant to reveal details about, discuss and indeed coordinate their internal systems such as the billing systems. By choosing a standardised service level as well as normalising the standards as far as possible, the network operators (with help from integrators and aggregators) have avoided engaging in such discussions and the potential problems associated with them. But, perhaps most important, this makes the standard robust in the sense that no single actor can block changes that do not fit their (monopoly) interests or if they do not have the resources. Thus, the standard is robust in the sense that every actor becomes to a certain degree superfluous, or at least replaceable.

7.3 The Transfer and Internationalization Processes

The CPA standard was successfully implemented in both cases presented above. And the CPA also turned out to be a success in terms of use and revenues generated (to varying degree though) in these countries. However, the speed of the transfer process varied. Seeing the Malaysian case as a case in point, we can also conclude that the CPA was more successful the more fully it was implemented as a national standard.

During the process through which CPA was established as a national standard, its characteristics discussed above were all crucial. In both cases, the national CPA standard emerged through an evolutionary process where it was growing in terms of elements included in the standard as the scopes of agreements expanded. Through these processes, the CPA also turned out to be flexible and robust in allowing for adaptation to various

local specificities (like regulatory frameworks, installed bases of services based on IVR technology, fraud problems, etc.). The standard also remained informal. The most extensive formal specification was produced in Malaysia, where the agreement among the actors was strongest.

The standardization process consisted in all cases of three major steps: first convincing the affiliate to go for an "open garden" approach, then the other operators that they should do the same and that they should collaborate about access numbers, price structure, etc., and finally specifying and implementing the standard. NorTel expatriates played important roles in all cases. And the project members involved in Malaysia did actively contribute to making that transfer the most successful. Content providers – or lack of - were also important. Content providers have a clear interest in open standards and platforms. The company Howtraffic together with TV2, for example, did indeed play a crucial role in the processes leading to a consensus about CPA in Malaysia. And in the other countries, content providers put increasingly more pressure on the operators as they were growing in numbers and the positive experience with the CPA increased. An important aspect of the standardization processes was also the fact that the CPA contributed to its own success by proving itself superior to other approaches to selling mobile content. It gained acceptance and was established not all at once, but in stages where one was building on what already existed in a modest fashion. Nurturing the installed base of technical components, social relationships and networks, as well as external actors, was a vital process.

7.4 CPA as Fluid: Towards a Theory of Fluid Standards

Some of the important features of the CPA standard, making it flexible is in line with those identified in the research literature presented above. It confirms the importance of making standards simple, as argued by Hanseth et al. (1996). It also confirms van den Ende et al.'s (2012) arguments that a standard's flexibility makes its adoption more attractive to new potential adopters and the diffusion process smoother. In addition, it illustrates the importance of an open, or end-2-end like architecture a la the Internet. However, the important features of the CPA standard we have pointed out goes beyond this. We see the characteristics of the CPA standard as closely related to the ANT concept of fluids.

de Laet and Mol (2000) defined a fluid as having six characteristics: no clear boundaries; multiple identities; mixtures; robustness; continuity; and dissolving ownership. We will discuss each of these briefly in relation to the CPA standard. This definition of a fluid matches well the characteristics of the CPA highlighted above, and accordingly, the success of the CPA standard can largely be explained by its fluid character. But the success of the standard also depended on the fluid character of the "CPA standardization body." Seeing a standard as a fluid is almost the exact opposite of the traditional and still dominant view on standards in general and within telecommunication in particular (and the one shared by all standardization bodies) where a standard is seen as an "immutable mobile" consisting of a set of documents giving an exact and consistent definition of a context-free piece of (more or less) pure technology.

We will start with the last of the six characteristics of fluids: dissolving ownership. Dissolving ownership allows for different actors to take ownership, make a contribution and then release the ownership. It is such taking and releasing of ownership which

created the movement that brought the CPA standard from one country to another. NorTel took the initial ownership in taking it to the other markets but was also ready to release ownership allowing first their subsidiary and then the other mobile operators to adapt it to the local context and make it their own. Numerous content providers took ownership individually in terms of selecting, developing and marketing content and in so doing, they collectively drove the business and contributed to the CPA's success.

Lack of clear boundaries between what is inside and what is outside the standard is closely related to the standard's open character. What content should be sold was undecided in the beginning and has changed over time. In Ukraine, the SMS delivery channel turned out to be only one option as IVR turned out to be more popular. Allowing the CPA standard to change and adapt to different contexts aided the transfer processes. It was in a way up to the context dictated by what had existed before, the business environment, operators and content providers that decided which parts of the original Norwegian model should be adopted or omitted. The ability to do that and the fact that the standard could still exist as a standard and also accommodate constraints in the context contributed to its transferability. The lack of boundaries has also made it easy to extend the standard when new requirements have emerged.

The openness means that there were no clear boundaries between the inside and the outside of the standard and the group of participants in the standardization process. Further, there was no clear distinction between central and peripheral actors related to initiatives, innovativeness, risk-willingness and investments. This characteristic is a crucial precondition for enabling innovative activities related to content services.

The CPA also has multiple identities, as different aspects have been of prime importance for various groups of actors. For instance, for some, it has been a business model and a technical architecture for others. What aided in terms of its internationalization was that it carried the identity of being a success story from Norway that some of the other markets wanted to emulate. In Hungary, the identity that the CPA could be a source of fraudulent misuse subjected it to additional requirements from the operators. It is thus important to be aware of the more important identities that develop and to address them either by accommodating them or trying to overcome them, which were also done later in Hungary. The fact that a standard can accommodate different identities, however, adds to its robustness in terms of satisfying more owners and encompassing different boundaries. The fact that the CPA standard can mean different things to different actors secures its usability across multiple actors and situations.

The mixture that composes the CPA consists of technical platforms, revenue models, mobile operators, the GSM network, content providers, mobile content, SMS, etc. Along with the boundaries, it is a mixture that is continuously composed and re-composed with different parts having different significance to different groups and over time. This also contributes to its robustness.

Continuity was also an important aspect allowing the standard to be moved over and still be a part of what existed previously. There were no sounds of loud revolutions as the CPA standard was implemented in the different markets. Instead, there was the flow of continuity and connectedness with related objects, time and space. That continuity also implied a connection with and the building upon existing installed bases.

Two of the characteristics of the CPA standard we identified as important for its success do not relate equally directly to the definition of fluid: CPA's simplicity and the fact that it builds on the installed base. But indirectly, they do because they both contribute importantly to the CPA's flexibility, and accordingly to its robustness and continuity. We have summarized these characteristics in table 5 below.

We also believe that the fluid character of the organizing of the standardization effort contributed to its success. In one way, the organizing of an effort aiming at the development of an open standard has to be fluid by definition in the sense that anybody is free to participate, i.e. there are no clear boundaries between those that can participate and those that cannot. But in this case, the organizing was also fluid in the sense that there was no clear structure. Informal projects and meetings were organized as needs emerged. This contributed to the flexibility and robustness of the effort.

Characteristics of CPA as a Fluid Standard	
No clear boundaries	Undecided what content to sell, easy to extend, no distinction between central and peripheral actors in the standardisation process.
Multiple identities	For some business model, for others technical architecture. Success from Norway, and a source of fraudulent misuse in Hungary.
Mixtures	Technical platforms, revenue models, mobile operators, the GSM network, content providers, mobile content, SMS, etc.
Robustness	Continuously composed and re-composed with different parts having different significance to different groups and over time.
Continuity	Connection with and the building upon existing installed bases.
Dissolving ownership	NorTel took the initial ownership but was also released ownership, allowing first their subsidiary and then the other mobile operators to adapt. Content providers took ownership individually, and in so doing, they collectively drove the business and contributed to the CPA's success.

Table 5: Summary of the Fluid Characteristics of the CPA

We find the concept of fluids, or fluid standards, a promising approach to theorizing standards. Such theorizing will take the tension or, more precisely, the duality between standardization and flexibility (Hanseth et al. 1996) as the starting point. Further, as argued by Braa et al. (2007), flexible standards facilitate the successful evolution of infrastructures based on the paradoxical principle of "integrated independence." So far, research on flexible standards has focussed on the attributes of the technical standards that make them flexible like modularization, simplicity, and extensibility and standardization strategies that facilitate the development and maintenance of flexible standards like (flexible) generification. Seeing standards as fluids move us beyond this approach by also incorporating non-technological (organizational, procedural, etc.) elements into the standard and the standardisation process. This flexibility makes standards more robust and flexible by extending the spaces for change when such change is required. At the same time, fluid standards imply different mechanisms and dynamics, and thus different skills for those involved. Fluid standards emerge through networks and processes of negotiation between complementary but also competing actors.

7.5 Beyond Fluids?

Should all standards be fluid? No, we do not think so. The fluid character of standards is of particular importance in domains when, for instance, larger numbers of actors of different kinds are involved; things are rapidly changing; technology is closely linked to

user practices or needs or in what Volberda (1996) calls hyper-competitive environments. In such domains, there is large uncertainty about user needs and preferences and spaces for experimentation and innovation becomes crucial. M-commerce is one such domain. A related domain which is currently attracting a lot of interest and a huge number of actors is Mobile Financial Services (See, for instance, Lee et al. 2005, Jaspers et al. 2012). Information infrastructures, including their standards, for health care, is another (Hanseth et al. 2006, Braa et al. 2007). Of the factors mentioned, uncertainty about user needs and preferences is, maybe, the most significant. Other parts of telecommunications standardization, for instance, the development of standards for interoperability across different messaging services (e-mail, SMS, chat- systems, etc.) of the kind being developed by the Open Mobile Alliance (OMA) is an example where seeing standards as "immutable mobiles" still make sense.

The discussion of "immutable" and "mutable mobiles" is a part of "the Rise of Objects in the Study of Organizations" (Engeström and Blackler, 2005) and the research on the role of objects in "socio-material practices" (Suchman 2007, Nicolini et al. 2012) as well as recent discourses about globalization and the changing "nature" of modernity where scholars like John Urry (2002) and Zygmunt Bauman (2000) have proposed concepts like "global fluids" (of which the Internet is presented as the paradigm example) and "liquid modernity" to capture the nature of these changes. We see standards as important objects in modern life and think that more research on their "nature" should produce significant contributions to this stream of research. The aim of this research reported in this paper, however, has been to make a contribution to the narrower and specific discussions on standards within IS and related communities. But we will, however, offer a few reflections on the first theme.

We have pointed to the fact that standardization communities see standards as "immutable objects." At the same time, a key feature of standards is their rigidity and lack of flexibility as they diffuse, i.e. implemented into technologies which are widely adopted. Their rigidity originates partly from the embedded-ness into technologies and material objects, but also from their institutionalization and taken-for-grantedness. What is needed in the domain of standardization, then, is to move beyond pointing out that some objects are immutable while others are mutable. If the argument of this paper is valid, i.e. that we need fluid standards in certain domains, we need a richer concept of fluids which helps us comparing objects and discuss whether one (standard) is more or less fluid than another, what makes an object fluid or not, etc. And of particular relevance to the technology analysed in this paper, we need to know how a standard gets transformed from mutable to immutable as it diffuses and how to avoid that to happen.

In the case reported here, the CPA standard has been maintained fluid. One simple reason for this is the fact that the attitudes of those initiated the initial establishment has diffused along with the standard. I.e. all new actors being involved has had a pragmatic approach where keeping things open, informal, simple and flexible has been at the centre. To our knowledge, nobody has suggested that a traditional standardization approach should be adopted. The traditional arguments for defining compatibility standards are as valid in this case as in any other. If one started drifting towards such an approach, the complexity of the technology, as well as the organizational structure, would most likely start growing, and such increased complexity would produce a more rigid standard.

8. Conclusion

Based on describing the condition in which the Norwegian CPA standard emerged, this paper has attempted to bring new insights into the requirements for standards and the process in which standards emerge in the area of m-commerce. We have argued that our case gives evidence in support of the assumption that standards are important in this area in the same way as in other areas of telecommunications. However, this study shows that in order to be successful, such a standard ought to contain more than specifications of technical interfaces (Ballon & Hawkins, 2009). We need a fluid standard, a "mutable mobile" containing a variety of components. In addition, such a fluid standard needs to have certain characteristics: It needs to be based on an open or end-to-end like (i.e. extensible, scalable) architecture; complete in the sense that it covers all aspects that the actors need agreement about; simple so that it is easy to understand and to use or implement, such that it is cheap and easy to provide new services based on it, and that it is easy to change when new requirements are uncovered; informal in the sense that almost none of its features are specified formally or in detail; flexible and robust in the sense that when new requirements emerge, the overall infrastructure can be accommodated to them in several ways. The success of CPA hinged on the package of these different characteristics.

In a turbulent and unpredictable environment due to emerging technologies and new organisational relationships, the organisation of the standardisation work must fulfil basically the same requirements. It needs to be flexible, lean and simple, i.e. informal and based on ad hoc projects rather than formal rules, structures and projects.

Conceptualizing the CPA standard as a fluid standard contributes to our understanding of standards and standardisation work in a number of ways. First, in seeing it through dissolving ownership, we see how in the case of Malaysia, the standard was accepted more widely through the taking and releasing of ownership by the different operators and content providers. Second and related to this is the concept of identity. Even if ownership as in the case of the CPA standard is more in terms of making a contribution and then allowing others to make contributions; the identity the standard carries can have a significant impact on its fluidity and success. In Hungary, it was the identity of something that could be put to fraudulent use. Third, fluidity as unclear boundaries requires it to incorporate things that were not in the original model. The turning point in Ukraine came when the IVR channel was also included in the CPA standard, something which was not relevant in the other countries.

What we have argued here is that while standards are increasing in number and importance related to ICT, what we need is not necessarily more of the same. While standards as formal technical specifications will continue to play important roles, the current pace of innovation and the nature of actors involved in standardisation require something else. We see CPA as one example of the complexity, and the dynamics of a global world poses to standards and standardisation processes. In this paper, we have shown how the CPA standard successfully adapted to this novel situation and argued how the fluid character of the standard led to its success.

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