The emergence of the mobile Internet in Japan and the UK:

Platforms, exchange models, and innovation 1999-2011

Patrik Kärrberg

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Declaration

I certify that the thesis I have presented for examination for the PhD degree of the London School of Economics and Political Science is solely my own work other than where I have clearly indicated that it is the work of others.

Abstract

In 1999 Japanese mobile operator NTT DoCoMo launched arguably the world's first successful mobile Internet services portal called "i-mode". In Europe at the same time a series of failures diminished the opportunities to attract customers to the mobile Internet. Even though similar Internet technologies were available in Japan and the UK, very different markets for services developed during the initial years 1999-2003. When the West expected Japanese firms to become dominant players in the mobile digitalisation of services during the introduction of 3G networks, it remained instead a national affair. The dominant views of how markets for mobile services operated seemed flawed.

So-called delivery platforms were used to connect mobile phones with service contents that were often adapted from the PC world. Designing and operating service delivery platforms became a new niche market. It held a pivotal role for the output of services and competition among providers.

This thesis sets out to answer a set of inter-related questions: How and where did firms innovate in this new and growing part of the service economy and how are new business models mediated by service delivery platforms? It argues that innovation in the digitalised economy is largely influenced by firms achieving platform leadership through coordination of both technological systems and the creation of multi-sided exchanges.

This thesis demonstrates from cases of multi-sided markets in operator-controlled portals, of mobile video and TV and of event ticketing in Japan and the UK that defining the scope of the firm on the network level forms the basis for incremental innovation, the dominant form of service innovation. A parallel focus on coordinating platform technology choices forms the basis for firms to trade fees, advertisements, and user data, enabling control over profitable parts of multi-sided value networks.

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They say that even if you fall on your face you are still moving forward: After several years of more or sometimes less successful efforts with this research project on service innovations I would like to extend my gratitude to those who have supported me on the journey.

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Abbreviations and definitions

BREW – Binary runtime environment for wireless

CDMA – code division multiple access

DAB/DMB – Digital Audio Broadcasting/Digital Multimedia Broadcasting

DRM – Digital rights management

DSL – Digital Subscriber Line (technology that transmits digital data over the telephone network)

FOMA – Freedom of mobile access (NTT DoCoMo's third generation mobile telecom system)

GPRS – General packet radio service

GSM – Global System for Mobile communications

IS – Information systems

MMS – Multimedia Messaging Service

MVNO – Mobile virtual network operators

NFC – Near field communications

PDC – Personal digital communication

SDP – Service delivery platform

SIM Card – Subscriber Identity Module Card (used as identification in phones)

SLA – Service level agreement

SMS – Short messaging service (140 character messages sent between mobile phones)

"The mobile Internet" – refers to a subset of the Internet that is accessed through mobile phones

WAP – Wireless application protocol

W-CDMA – Wideband CDMA

3G – Third generation mobile telecom

Introduction

In 17th century Japan wheeled transportation was not allowed due to attempts to threaten law and order that might occur by industrious opponents to the shogunate (the military government). The speed of communication networks could thereby be throttled, and information exchange between remote regions of the country was sparse. In our own Internet era information and communication technologies are among the main catalysts for productivity and economic growth. Yet there is a long list of companies that were technology leaders but failed to prevail in the end as great companies. The social side of socio-technical change represented by management seems to have the upper hand in determining success, according to Collins in his management classic "Good to great"[1]. Organisations generally do not begin transitions with pioneering technology, since they cannot make good use of technology until they know which technologies are relevant. The story of the emerging mobile Internet holds many lessons about firms exploring technologies, how to position firms in value chains, and how to connect services with customers.

How and where will firms innovate in this new and growing part of the service economy?

Academics focusing on industry economics and management of technology represent two such disciplines attempting to answer these questions. One of the challenges in studying innovation is its interdisciplinary nature: Scholars of economics and management often belong to two different schools of thought with a respective focus on the macro (industries, trade, nations) and the micro (firms and individuals) view of entrepreneurial and innovative activities. Attempts to bridge this gap was pioneered by Schumpeter, whose main points rest on notions of the availability and use of debt financing by risk takers to introduce new techniques, structures or procedures. Schumpeter left technology as an exogenous (external) variable without studying much dynamics of technology innovation itself. Management studies on the other hand often focus on micro level resource allocation, leadership and capabilities. The latter could lend itself to a network unit of analysis, but rarely to suitable models of industry convergence and dynamics. By studying and modelling how services are delivered and facilitated between users and suppliers, an alternative method could be devised: that of so-called "platforms" and analysing its effects on innovation in converging markets. Baldwin & Woodard (2008) outline the utility of the platform concept in

[1] "Good to great" – why some companies make the leap… and others don't" (Collins 2001)

academic research: “A benefit of viewing platform architectures in a unified way is that theories and observations of seemingly disparate phenomena in diverse fields can be brought into focus as part of a coherent whole.” We can compare borderlands of innovation in different industries connected by platforms with the metaphor of an estuary. A highly fertile region is often created where fresh and salt waters mix. Depending on the geology and hydrology, such regions can form deltas or marshlands or saltwater meadows, or they might be rocky, barren regions where the waters wash back and forth without much short-term effect. Similarly, in the case of different business interactions, there are a variety of forms that can be created by the mixing of ideas, projects, goals and especially the creative engagement of different kinds of people. Sometimes these relations can also be barren, so it is worthwhile discovering those forms of interaction that are most fruitful, given the context of interactions that firms are able to create.

How do different business contexts give rise to different choices for firms?

Short-term increases in profitability and cash flows could be achieved by cutting costs. Much of the share price among communications firms was tied to future growth in the beginning of the 2000s of what was generally called the “dotcom bubble” or a “telecom meltdown” (Business Week 2001): Operators with declining landline revenues were pressured to expand, even if average revenue per user was declining globally as a result of subsidies and competition (Christensen & Raynor 2002). The exception was Japan where mobile operators had established portals that were appreciated by mobile phone users. In May 2001 alone mobile operators made US$700 million from packet fees and monthly charges on the mobile Internet, while content providers made almost $100 million as Funk (2001) describes in his book “The Mobile Internet: How Japan dialled up and the West disconnected”. Corresponding numbers in the UK were miniscule. It became obvious as the dotcom bubble deflated that growth without innovation and service improvements are not enough for sustainable profits.

Nevertheless, much technology innovation was pioneered during this time also outside Japan and later appropriated by the mobile telecom service industry that includes some of the most innovative firms in the world. In an annual Boston Consulting Survey on global innovation eight of the top twelve firms are closely linked to mobile services including Apple, Google, Microsoft, Amazon, LG Electronics, Sony, Samsung, and Intel (Andrew et al. 2010). Further down on this global list are European firms such as Nokia, Vodafone, Virgin, Ericsson, Siemens, and

Alcatel/Lucent. On the firm level mobile content and services are delivered through a large number of intermediate forms making up a chain or network of firms interacting. Division and firm boundary is one of the considerations when delivering services through such a network. As two leading markets Japan and the UK provide interesting material for studying these choices among firms. The thesis includes elements of comparison in two dimensions: firstly market implementations in Japan dominated by a national context, with those of the UK more influenced by the international market; secondly, a longitudinal study of the evolution of the mobile Internet over the course of more than a decade. Questions such as those focusing on what activities differed in markets and over time could partly be summarised in what is usually referred to as business model considerations. Variations in business models were amongst others based on technology and value chain positioning choices among firms. Platforms including network operators, handsets makers, service providers, and enabling firms in Japan pioneered the early transformation of digital content into an attractive experience for mobile phone users. These technology functions differ in business formations, and it is not necessarily so that for example Disney in Japan would relate to the telecom operator NTT DoCoMo in Japan in the same way as Disney relate to Vodafone in the UK. It is also interesting to observe how the value of services developed differently in the two markets (Karrberg & Liebenau, 2006; Tee & Gawer, 2009). Some things were for free in Japan while it was charged for in Europe and vice versa. Part of the purpose of this thesis is to show that no best platform architecture exists without knowledge by involved firms of its surrounding markets, and the comparative element of the thesis describes in historic terms the incremental growth of the mobile Internet that took place in Japan and Europe. We also show why seemingly incremental innovations in the eyes of users were often disruptive for firms involved in delivering the same service.

How are better business models being defined to support platform innovation?

It is important to connect the analysis of the thesis to on-going conversations in the literature and industry. The turn-over and growth of the mobile telecom service industry could be estimated in real terms, but to reach an understanding of the underlying dynamic mechanisms of change in an industry, it is necessary to take part in this evolving conversation directly with key individuals through interviews. Archival research provides an important background, and so do presentations and key note speeches when identifying current topics and developments relevant to the thesis. This thesis sets out to answer a set of inter-related questions: How are multi-sided

markets created with the help of platforms in the converging internet and telecom industries; and how can we model industry structures where firms innovate?

We can break down our areas of investigation framed above to research questions that we will explore further in the thesis:

a. How do firms innovate in the telecom industry utilizing the mobile Internet and digitalization of content delivery to create new service markets ?
b. What role do platforms play to modify industry structures when new markets are created?
c. How does the architecture of platforms affect the creation of new business models?

Part I:

Theoretical considerations

Literature review of innovation in a converging telecom-Internet industry

The current thinking about innovation

In order to address our first research question regarding innovation with services and the role of internet technologies we consider a variety of approaches to the study and practice of innovation management. Frequently we face confusion as economists of different schools of thought, analysts of management practice, engineers, historians of technology, sociologists and others each begin with different starting points and apply very different methods. In this introduction we review these differences and show how it is that they come to different kinds of conclusions relevant to this thesis. We also consider the extent to which they are compatible, where syntheses of approaches are possible, and why some kinds of analyses are ignored. Three sets of literature are reviewed in this chapter to position our research and contributions: innovation management, convergence and platforms, and business models.

We consider institutional and resource-based approaches and argue that these forms of analysis have both more solid intellectual foundations and potential for greater utility. We especially address how they can and should be applied to general areas such as standards setting and regulation. We also consider how national innovation policies, both explicit and implicit, are affected by differing forms of analysis and how they can best be interpreted from an institutional perspective.

Our purpose at the outset is to review the leading and most popular figures in recent debates, starting with Josef Schumpeter and the "neo-Schumpeterians". We provide a review of the work of Thomas Hughes and Clayton Christensen and consider their influence in relation to other well-known innovation theorists such as David Teece, Eric von Hippel, Everett Rogers and Henry Chesbrough.

Current discussions on innovation tend to emanate from the influence of Josef Schumpeter, whose writings from the first half of the twentieth century did much to define economic debate on innovation, business cycles, and especially the nature of entrepreneurship. Although there

are much earlier roots, dating to the Classical Era and beyond, Schumpeter's extensive empirical work and path breaking analysis of the character of change and especially the institutional and individual characteristics of innovative persons and organisations provided an alternative to models from the neo-classical school of economics.

Schumpeter's main points rest on notions of the availability and use of debt financing by risk takers to introduce new techniques, structures or procedures. Plentiful and routine debt financing, through loans, venture capital, or other forms of third-party investment changed the ways in which individual entrepreneurs conceptualized risk, and through the twentieth century these notions of risk taking for change were progressively introduced into organizations. This alters the behaviour of firms and the nature of competition, and careful consideration of the significance of such activities holds major implications for business strategy, industry structure, regulation and even macroeconomic fiscal policies.

Schumpeter spent much of his life championing these ideas against the prevailing concerns among economists, which focused on macroeconomic features and excessive quantification that distracted attention away from the motives and behaviours of economic actors (Schumpeter 1943). Much of the mainstream of academic economics relegated technology to be merely an exogenous factor, unaffected by the organizations that produce, modify, apply and use those technologies. Similarly, they regarded the key factor inputs to be limited to capital and labour, with scant consideration of inputs such as entrepreneurship, business strategy, or management qualities. Schumpeter also coined the famous notion of innovation that he called "creative destruction". It relates to a limited number of options to technological substitution as seen in the perspective of the firm. A firm might switch to the new technology, accelerate improvement of the established technology, or exit from the market.

Until recently, mainstream neoclassical economists, did not study innovation in any meaningful way. Where there have been efforts to accommodate "neo-Schumpeterian thinking", neoclassicists have turned to quantifiable and model-able proxies for innovation. Some of these works are extremely useful for addressing a few narrow issues that are key to our current understanding of innovation. Examples of this include studies of patenting activities and R&D investments. If, to take one case, we regard the filing of patents to be an indicator of innovative

activity, we can use such econometric analyses to address questions such as: what differences occur in patenting activity of certain types from year to year and among countries. We can analyse the differences between industry categories, and we could correlate these analyses with other aggregated indicators such as the degree of concentration in such sectors, the overall rate of growth, or relationships between patterns of patenting and R&D investment practices. Studies of R&D investments have shown relationships with profitability, but with sharp differences between sectors. They have also provided the means to gauge ranges of investment, offering clues on "optimal" spending practices and justifying research strategies such as portfolio building. Neoclassical studies of these sorts are published in mainstream economics journals in addition to specialist journals such as *Research Policy* and *Economics of Innovation and New Technology*.

Researchers following Schumpeter's approach have had less impact on mainstream academic economics but hold considerable influence in management studies and many cognate disciplines, including sociology, business history, and the social studies of technology. For these approaches there are a few explicitly Schumpeterian publications, including *Industrial and Corporate Change* and the *Journal of Evolutionary Economics*, and the influence has been strong among those concerned with the effect upon business profits.

T P Hughes belongs to the technology system school and continues in Schumpeter's footsteps with historically oriented and qualitative research, where he has applied the approach to cases from networked industries such as the electricity industry. Hughes (1983) tries to explain how technical innovation focus around the elimination of obstacles to growth, called "reverse salients", that will be used throughout the thesis. Bijker & Pinch discuss a "seamless web" that can be seen to develop between society and technology (Bijker et al. 1987). A heterogeneous network emerges from this "seamless web" of socio-technical factors behind innovations and development, a socio-technical system. Technological and scientific knowledge is therefore dependent on the actions and settings of human beings and society as such and knowledge can be seen as a social construction. They further claim that inclusion in a social group dampens radical change as high inclusion brings mission orientation and commitment to incremental improvements in the evolving technological system identified by the group, organisation or bureaucracy.

A further connection of the technological system to institutions is done by Howells (Howells 2005), who analyses the character of technology's integration with society. Good practice in innovation management springs from firms in symbiosis with institutions, such as financial services, intellectual property rights, technological education, regulatory and other state bodies, and international standards. Industry leaders from a previous product generation often fail in keeping their leadership through the transformation into the new product generation, as the mind-set (or business model) is still focusing on the old architecture, missing out implications from novelties (Christensen 1997).

Evolutionary theorists (Nelson & Winter 1982) argue that firms engaged in a search process do not explore all possible directions but confine their search to the most promising directions. Firms are often engaged in `local search' only, which means that search is limited to related areas and continue to rely on their basic routines instead at adapting to change. Economic competence, the ability to identify, expand, and exploit business opportunities, is unevenly distributed among firms (asymmetric capabilities). Firms operate with different knowledge bases and under different assumptions concerning present, but most importantly, future (missing) markets. The variations in the knowledge which guides management in their investment decisions, including their strategic choices, arise from long historical processes, central to which are learning processes which are local and cumulative as well as path dependent (Michie 1998). Rationality, on these assumptions, could be argued to be quite different between firms as a result of the different experiences accumulated by management.

Eric von Hipple challenges the popular notion that manufacturers dominate as innovators in his seminal book "Sources of Innovation" (Hippel 1988). He discusses the limitations of market research and suggests instead how users, especially so-called "lead users" can assist in predicting new sources of innovation and support the identification of the processes behind it.

Tidd et al. (1997) suggest four phases making up the innovation process among organizations: 1) Scan and search of their environments to pick up signals of potential innovations (signal processing). 2) Then strategically select the things which offer the best chance of developing a competitive edge (strategy). 3) Having chosen an option, organisations need to resource it for

exploitation (resourcing). 4) Implement the innovation from idea to launch, as a new product/service, or new process or method within the organisation (implementation). Networks can partly compensate for limitations in the firm's search space.

A basic assumption in the network model is that the individual organisation is dependent on resources controlled by other organisations. Because of the interdependencies of firms, the use of an asset in one firm is dependent on the use of other firms' assets. This dependency between firms, or actors, has to be coordinated. Coordination takes place through firms interacting in the network, in contrast to the traditional market model where coordination is achieved by organizational hierarchy or through the price mechanism (Porter 1998a). Networks can also be seen as actors on a higher level (Law 1992). Actors and artefacts (products, companies, networks of companies) interact to adopt new artefacts within the network (Latour 1999). Economics of the information economy and the study of innovations contrast with much neo-classic economic theory that requires future prices, costs, and competitive scenarios to be known in full. This knowledge is not common in a fast-moving industry, where uncertainty is a given (MacKenzie & Wajcman 1985).

"Why then is innovation so important to *firms*?" Tidd, Bessant and Pavitt ask this question in their seminal book "Innovation Management: Integrating Technological, Market, and Organizational Change" (Tidd et al. 1997). Firstly they say, new products and services help capture and retain market share and increase profitability. Secondly, new product development is important as the environment is constantly changing, creating new opportunities and constraints. Innovation has dynamic effects which are crucial (Rogers 1995) and can be brought together with the concept of the business model and innovation strategy (Chesbrough & Rosenbloom 2002).

That innovation is important for a firm's survival is shown by Utterback's study (1994) indicating that whole industries can be undermined and disappear as a result of radical innovation. He further concludes that most innovations destroying an existing industrial structure originate from outsiders to a particular industry, and secondly that few of the original players survive such

transformations. We note that Utterback's findings resonate with Schumpeterian "creative destruction".

An influential framework for categorizing innovations is provided by Henderson and Clark (1990), where they especially discuss the role of architectural innovation as creating new product generations. In this model they expand the notion of radical and incremental innovation to also include what they call modular innovation. Industry leaders from a previous product generation often fail in keeping their leadership through the transformation into the new product generation, as the mind-set (or business model) is still focusing on the old architecture, missing out implications from the new architectural innovation:

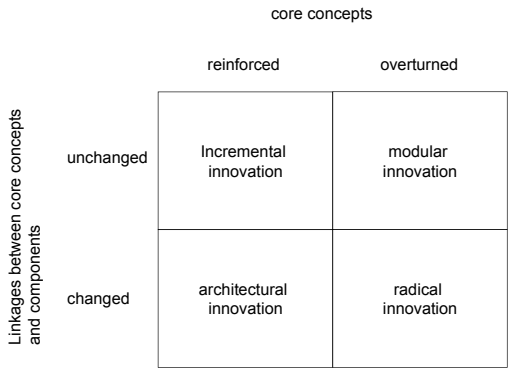


Figure 1: Innovation described by core concepts and linkages (R Henderson & K. Clark 1990)

In a later section we will discuss how core concepts in platforms are manifested as core components that are not overturned, i.e. an example of incremental or architectural innovation. For some, such as Rogers, the unit of analysis is foremost the individual who reacts to innovative actions in ways that can be scaled up to organizations and networks of activities. It is in this way that diffusion takes place, the dynamics of which relate the individual to the organization and which give institutions attributes that are analogous to the habits, bounded vision and "thought" of individuals (Douglas 1987). For others, such as Chesbrough, the firm behaves more like an organism which can have different kinds of changing relations with its environment, forging alliances, joining networks, taking partners and freely changing its boundaries.

Chesbrough's approach is additionally interesting since it notes the limitations of the typical activity firms engage in by restricting their efforts to innovate to local searches. In narrowing

their options to closely related areas of investigation, they settle into basic routines which forego broader opportunities. Since firm competences in the ability to identify, expand and exploit business opportunities is unevenly distributed among firms, organizations that successfully adopt more open innovation models could enjoy an increasing absorptive capacity, close understanding of customers' and suppliers' needs, and the direction of future trends. Chesbrough has described an "Open Innovation Paradigm" (Chesbrough 2003) where organizations change strong conventional boundaries into a structure that is strongly integrated with the external environment. One aspect of that is an open approach to networking and alliances with partners and clients. Evolutionary theorists argue that firms engaged in a search process do not explore all possible directions but confine their search to the most promising directions. Organizations that successfully adopt the new open innovation models could enjoy an increasing absorptive capacity, close understanding of customers' and suppliers' needs, and direction to future trends. This is set in opposition to the closed innovation model, where research, development and commercialization is undertaken internally, which is assumed to create a competitive advantage. In the closed innovation model organisations screen the research projects, and select the most viable ones for development. According to this paradigm, "Successful innovation requires control". Examples of organizations that have followed this model include GE, DuPont, IBM, and Xerox. It could be argued the closed innovation model does not suit today's (knowledge) landscape any longer. Knowledge is dispersed, and innovation can take place anywhere. Furthermore, shortening product lifecycles and diminishing R&D returns put organizations in financial jeopardy.

Financial implications of open innovation presumably include lower costs by leveraging on external R&D efforts and higher revenues by tapping into new markets and enhancing rates of innovation. The challenges for "open innovators" include to successfully integrate external ideas and capabilities; coordinating many external sources of ideas and capabilities to their own advantage; simultaneously maintaining the strength of their own internal research function and becoming successful architects of innovation. This relates to Chesbrough and Rosenberg's notion of also developing successful business models and to spot the "architecture of the revenue" (Chesbrough & Rosenberg 2002). The business model can be said to be a situational cognitive model of value creation, being incremental and divisional rather than rational and corporate in order to support the firm's adaptation process to changes in the external environment.

Consistent failure to interpret possibilities in the environment of the firm (its marketplace) and commercialise technology may force the corporation to reduce or withdraw from its technology development. Strategic advantages of innovation can therefore be integral and central to business models:

Type of innovation	**Strategic advantage**
Novelty	Offering something which no one else can
Competence-shifting	Rewriting the rules of the competitive game
Complexity	Difficulty of learning about technology keeps entry barriers high
Robust design	Basic model product or process can be stretched over an extended life, reducing overall cost
Continuous incremental innovation	Continuous movement of the cost/performance frontier

Table 1: Strategic advantages of innovation (Tidd et al. 1997)

Certain innovations can be described as "disruptive", also known as "transformative" technologies. Disruptive technologies improve certain product features while sacrificing others, and are typically more appropriate for new customers than existing ones. Clayton Christensen, who popularised this notion in his seminal book *The Innovator's Dilemma* (1997), based much of his argument on a detailed study of the hard disk drive industry in the 1970s and 1980s. He found disruptive technologies at work as established manufacturers were not interested in supplying smaller disk drives with smaller memory (and margins), while new entrants took new customers. This trend was repeated for minicomputers, PCs and laptops. Commenting on the Japanese mobile telephone industry, Jeffrey Funk (2004) noted that some technologies are disruptive for certain incumbents but not for others, depending on previous technology base and choices. The Sharp and Seiko companies commercialized LCDs faster than RCA, which was the firm that developed them, since this new technology was not disruptive for one of their current markets (calculators that required low power consumption) while it was disruptive for computers, because of insufficient speed, which was the main market for semiconductors in the US. These

sorts of disruptive technologies often start from a lower performance level, but typically increase rapidly to higher performance levels.

We should take this phenomenon along with George Stigler's observation (Stigler 1951) that many industries begin vertically integrated due to their small size but then gradually become populated by specialist firms as they grow. As an industry's demand begins to contract later in the life cycle, industries tend to reintegrate. Christensen et al. (2002) connects an industry's vertical integration and horizontal stratification with the notion of "structured dialogue". When structured dialogue takes place between two actors, *markets* are the most efficient coordination mechanism between firms (as in contrary to *vertical integration* of functions within the same company). Three conditions must be met for a "structured dialogue" to take place:

1) The customer that procures must be able to specify which attributes and parameters must be provided
2) Metrics for those attributes must exist, and the technology to provide those metrics must be readily available
3) The procuring company must understand the interactions or interdependencies between the attributes of what is provided and the performance of the system in which the procurer will use it.

When these three conditions are not met, interfaces are *interdependent*, and firm integration (vertical integration) is the most effective form of coordination.

As an industry is developing with new technology, structured dialogue will sometimes be the general case and sometimes not, and added value will shift from some parts of the value network to others. This causes swings in a cyclic pattern between horizontal stratification and vertical integration with time. A decision by a company to outsource a less profitable component could later turn out to be a vital component for future vertical integration and profit zones again. A famous example is IBM's decision to create a structured dialogue with Microsoft for the PC operating system, which at the time was less profitable than the vertically integrated hardware that IBM provided. Years later, the OS turned out to be a profit zone rather than the hardware. When IBM realised this it was already too late for them to enter the OS market.

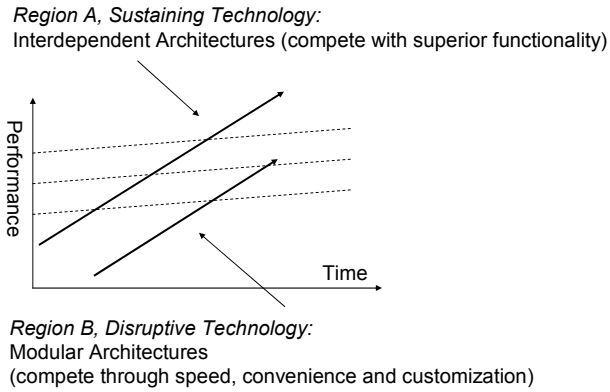


Figure 2: Disruptive technology vs sustaining technology (Christensen et al. 2002)

Christensen & Raynor (2002) extend the argument of structured dialogue into a best practise for the firm: The ability to deploy new technology-driven services depends on aligning the degree of control a firm exercises over service's value chain and the technological architecture of that service. In general terms, interdependent technological architectures are best developed by firms with integrated value chains, whereas modular technological architectures are best developed by firms with focused value chains.

Teece & Pisano (1994) view firm-specific capabilities as being renewed and embedded in its processes, market positions, and expansion paths. Dynamic capabilities are strategic and they cannot be homogenous assets. These are e.g. internal competences such as values, organisational experiences, and culture that cannot be bought on the factor market. Replication and transmission of knowledge can only take place when information is codified, specified and it is understood that replication takes place. The two main values of replication are to support geographic and product line expansion, and the spread of valuable capabilities to customers. Strategic change is costly in the dynamic capability view and therefore gaining opportunities for competition through diversification are costly. It can be made easier when an efficient market for technology exists.

Jacobides et al. (2006) discuss how the structure of an industry (what they call "industry architecture") can be changed to benefit a particular industry participant, and especially innovators. They use the two dependences of *complementarity* (in products, services, and

processes, which refers to the combination of two or more assets) and secondly they discuss *mobility,* as the number of assets that can potentially enter a combination, with negligible switching costs. They refer to the latter as *mobility* in assets that are components of a combination. Jacobides et al. claim that firms who manage to achieve both high complementarity and high mobility in their vertically adjacent segments can appropriate value without owning the complementary asset. Four cases of high and low mobility and complementatiry respectively are outlined by Jacobides et al. (2006):

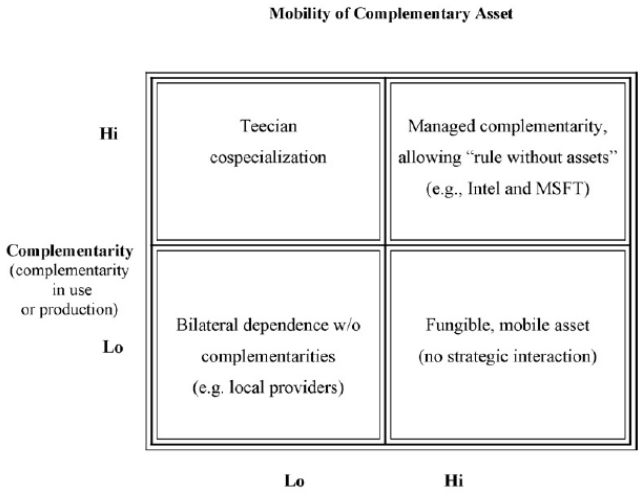


Figure 3: Complementarity vs. mobility: dependence and complementarities

Tee & Gawer (2010) review mobility and complementarity of industry architectures in their study of NTT DoCoMo's i-mode in Japan and the Netherlands. Their study suggests that differences in the underlying industry architectures explain why similar platform strategies led to such different outcomes.

There is a rich literature on the importance of co-location of firms for developing networks and innovative capabilities in so-called geographical clusters: SME districts in Northern Italy (Rabellotti 1997), hi-tech clusters in the US (Saxenian 1994), and mobile services in Tokyo (Kärrberg & Marnung 2001), to mention a few. The clustering on a national level (Porter 1998b; Berggren & Laestadius 2003) engages policy makers more intensively than corporate leaders.

Shapiro & Varian (1999) describe the characteristics of the information economy in terms of classic economic theories: many tried and true principles are valid for the Internet, and

information technology in general, but information and communication technologies (ICTs) offer new opportunities and challenges in applying these classic economic principles. Further, information is an "experience good" often meaning that consumers don't know the value until they have experienced it on their own. This has implications for pricing of information goods. The industrial economy is driven by economies of scale, whereas the information economy is driven by economies of networks and supports a plethora of new and improved services.

Service innovation

Service innovation is a topic of growing concern for researchers and policy makers as services constitute the larger part of employment and output in most developed economies. The telecom and media industries are relatively technology intensive and increasingly deploy the Internet when producing and delivering services (and users increasingly consume over the Internet as well). As we experience a major overturn of the media industry (Internet based media taking over paper media), we recognize that generalizations about the nature of services and innovation in services must be qualified by numerous exceptions. Nevertheless, a set of common features characterize many services and differentiate them from manufacturing.

To start with, many services products are intangible, and sometimes difficult to protect via patenting. Services are typically interactive, involving a high level of contact between suppliers and customers in design, production, delivery, and consumption. Service products are often produced and consumed in the course of supplier-client interaction at a particular time and place ("coterminality"). Innovations may focus on this interaction as well as the conventional product and process characteristics, and could rely less on technical knowledge and more on social, managerial and cultural aspects. Some services are delivered electronically, such as most Internet information services (Miles 2005).

Until the 1980s innovation in services received little attention among researchers and policy makers. Fast forwarding to 2009, R&D in services made up 24% (up from 19% in 2001) of total R&D spending in UK businesses (Office of National Statistics 2009). The 2003 analysis of UK's Department of Trade and Industry (by Company Reporting Ltd) ranks R&D spending in IT services as fifth largest in worldwide spending and sixth largest in the UK. British Telecom is the fifth largest R&D spender in the UK, and IT service R&D made up 5% of UK's total spending (Miles

2005). In 2004 UK ICT investment accounted for 14 per cent of total UK investment, compared with 13 per cent in 1992 (Office of National Statistics 2006).

Penrose (1959) proposes that firms transform resources into services, and use these services as inputs, rather than the resources themselves. This forms the basis of the so-called resource based perspective of the firm and its innovative capability. Liebenau & Tanai (2009) endorse the utility of the resource based perspective when attempting to distinguish between behaviours in innovation in the manufacturing and services sectors.

Theodore Levitt (1972) argued that service firms needed to adapt industrialized processes, division of labour and higher levels of technology. Fast food restaurants have adapted such standardization processes, being able to add new modules, expand internationally with branches of similar concept. On the other hand, mass customization and flexible specialization make manufacturing more like services. By viewing services as a number of components, quality control principles and monitoring can be applied. This assists in finding areas where change needs to be engineered, opening up opportunities for innovation (Sundbo 1998).

Modularisation forms the basis for much service innovation, since decomposition of service processes and/or products may spur process innovation and the identification of new products and product combinations. This type of innovation activity does not necessarily rely on R&D investment, although those sectors where there is much talk of unbundling (telecom and software), there is much conventional R&D. Therefore service delivery integrates technology (manufacturing) innovation with service innovation bundling (Miles 2005).

Brynjolfsson (1993) noted how IT has been widely applied across service sectors, to the point where there is disproportionally more investment in IT from services than from manufacturing. He calls this the “productivity paradox”. IT provides a technology that can be applied to generic information processing of services, much as earlier revolutionary technologies in energy technology (steam engine or electric power) could be applied to manufacturing. In a way, IT has created an industrial revolution in services according to Brynjolfsson.

Barras (1986) describes a “reverse product cycle” in technology based innovation, involving three phases: improved efficiency, improved quality, and new services. This description has spurred debate on conceptual difficulties such as increased blurring between production and consumption and to determine when innovation shifts from efficiency enhancement to product innovation. Other studies of service innovation focus on the relation between supplier and clients, such as the concept of “servuction” (hinting at similarities with production), and jobbing vs sparring activities (Tordoir 1995).

Christensen & Raynor (2002) claim that market opportunities that are potentially significant to communications firms in new services are fundamentally products of convergence. That is, they are the result of recombining components of separate industries into a new value chain, where a new level of interdependence is created.

As with the economy as a whole, software product firms have seen a steady rise of services as percentage of their turn-over. Cusumano & Suarez (2008) show how software firms (standard industrial classification 7372, excluding videogames firms) saw services surpass 50 percent of revenues in the early 2000s and have continued to grow since then. They further claim that most of academic research on platforms has not paid enough attention to services.

The supporting role of IT and Communications Technologies

In the following section Hughes’ (1987) view of networked technology innovation taking place as part of the evolution of large technological systems is explained: It is a method of presenting the history of evolving, or expanding, systems in *phases* in which the activity named predominates: Invention; development; innovation; transfer; growth; competition, and consolidation. It may not necessarily occur in that order. In this thesis we refer to the Internet and the subset of services accessed by mobile phones as a large technological system.

System builders, like Edison, strive to increase the size of the system under their control. Once innovation occurs, inventor-entrepreneurs tend to fade from the focal point of activity. Hughes explain how technical innovation focus around the elimination of obstacles to growth, called reverse salients. Often staff and organizational forms are a reverse salient. Industrial laboratories, which proliferated in the first quarter of the 20th century, proved effective in conservative

invention, but not radical innovation. The laboratories routinised invention. A mission-oriented laboratory tied to an industrial corporation or government agency with vested interest in a growing system nurtures it with conservative improvements or with inventions that are responses to reverse salients. When a reverse salient cannot be corrected within the context of an existing system, the problem becomes a radical one, the solution of which may bring a new and competing system. In the growth and consolidation phase of a technological system the focus often lies on reverse salients, according to Hughes.

Because radical inventions do not contribute to the growth of existing technological systems, which are presided over by, systematically linked to, and financially supported by large entities, organizations rarely nurture a radical invention according to Hughes. Radical as defined here, are defined as inventions that do not become components in existing systems. As earlier mentioned by Henderson & Clarke (1990), architectural and incremental innovation support reinforced components within an existing system.

Technology transfer is affected by legislation and market as the case of the first transformer shows. In the early 1880s Gaulard and Gibbs introduced a transformer suited for the British electric lighting legislation, but Westinghouse developed their design for mass production in the American market. The subsequent success of Westinghouse's transformer shows that legislation and market is important for how technology transfer takes place.

The load factor originally referred to the ratio of average output of a generator or utility system. Load factor also refers generally to how a technological system is utilising a particular investment and the related unit cost, thereby giving us a metric for return on investment.

Technological systems do not become autonomous; they acquire momentum according to Hughes. It means as systems mature, they acquire style and momentum. They have a mass of technical and organizational components; they possess direction or goals, and display a rate of growth suggesting velocity. Concepts related to momentum include vested interests, fixed assets, and sunk costs. The durability of artefacts and of knowledge in a system suggests the notion of trajectory.

An alternative or complementary approach to study systems is to focus on networks and its importance for markets and innovation. Shapiro and Varian (1999) describe three basic characteristics of networks: 1) Network externalities (interconnected actors are affected by each other, positively or negatively, even if they are indirectly connected), 2) increasing returns (the value/utility of a network increases with the number of actors connected), and 3) path-dependencies and lock-ins (as actors get dependent on the network it gets increasingly difficult to leave it, as one follows the same path as the larger entity). Consumers value information technologies that are widely used, just as they value communications networks with broad reach. Positive feedback works to the advantage of large networks and against small networks. Standards change the economics of networks and the rules of competition. If a user base is tied to a technological standard, increasing returns applies to the standard too. This can be summarised in a standards reinforcement mechanism which also explains how a standard that builds up an early installed base before competitors, create path dependency among customers (Grindley 1995).

To explain the success and hurdles of mobile Internet services in Japan and the West, Funk (2001; Funk 2004) uses the concepts of network effects and disruptive technologies. Mobile phone products are increasingly compatible with standard Internet file formats (MP3, MPEG, Real, and windows formats), the value of a phone increases with the total number of phones on the market, and the technology richness of high-end phone contents are getting close to that of the fixed-line Internet, according to him.

Teece (1986) describes disruptive IT innovation as knitting together a set of interrelated technological and organisational advances involving qualitative IT base innovations and related IT innovation in development processes and services that further the exploitation of the base technology innovation by providing co-specialised assets.

Swanson (1994) developed Teece's ideas further in order to differentiate a theory of information systems innovation from organisational innovation theory. He recognises that innovators are frequently assumed to motivate imitative behaviour by others. Channels of communication are of central concern for the adoption process, and Swanson argue that these channels are significantly differentiated according to information system innovation type. Innovations can be

typed, e.g. such as new products (or services), administrative innovation (improving internal control, coordination, and structure), and technical innovations (changes to technology or work processes). Swanson also notes that administrative innovation and adoption often lags the technical innovation (which is more tangible) in an organisation. We note Swanson's focus on the IT department as a somewhat isolated unit from the rest of the company as perhaps typical of the pre-Internet-era in academia: he considers information systems innovation mainly taking part within the IT department, which reflects the situation until the mid-1990s before Internet technologies become ubiquitous in the economy. Swanson maps information systems innovation into two basic dimensions: 1) business impact and 2) technological and organisational feature composition. He then suggests an extension of this model with a third, the functional information systems (IS) core, which affects the business impact:

> "…IS innovation is understood to incorporate both the functional IS core and the business administration and technology cores via IS products and services".

We note Swanson's notion of a "core" and "value added processes" which we will get back to when discussing concepts of platforms in coming sections. Lyytinen & Rose (2003) extend Swanson's definition and define IT base innovations in terms of disruptive IT innovation as an architectural innovation originating in what they call the "information technology base", referring to Teece, Christensen, and Swanson. They distinguish between these three types of IT innovations and their interactions in what they call the "three-set model of IT innovation".

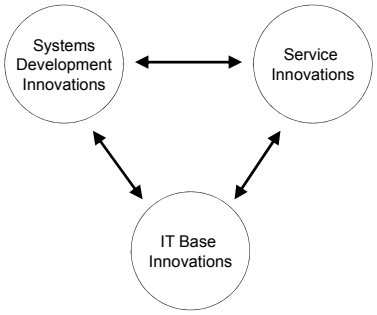


Figure 4: Three-set model of IT innovation (Lyytinen & Rose 2003)

Lyytinen and Rose further define the effects of disruptive IT innovation as pervasive in that it simultaneously and necessarily spans new services, and new types of development processes.

According to them the packet based telecommunication networks of the 1990s is a base IT innovation that spurred subsequent innovations in system development and services.

It is important to note that the above characterisation of IT base innovations only recognises necessary conditions for a disruptive IT innovation, but cannot be used in a strict sense to predict it. In the same way, diffusion is one of many dynamic effects of innovation (where absorptive capacity and strategic choices are two other elements).

Lyytinen and Rose also describe what they characterize as the radical nature of service innovations in the following:

- Administrative process innovation: Services become an integral part of the business web
- Technological process innovations: Services become inseparable from the organisation itself and its environment
- Technological service innovation: Services extend beyond the enterprise boundaries
- Technological integration innovation: When services are not easily identified

To put the role of disruptive IT base innovations in perspective, Bruland & Mowery (2005) provide a critique of frameworks over-emphasising the importance of allegedly critical technologies, and remind us of the technology system school:

> "…we challenge some of the historical discussions that stress that transformative effect of 'critical innovations'. Instead, we emphasise the complex multisectoral character of innovation, and hence the need to take seriously the coexistence of a range of innovation modes, institutional process, and organisational forms. Our discussion of innovation through time highlights changes in the structure of the innovation process in successive periods, and is informed by the innovation system concept."

Christensen & Raynor (2002) claim that a general decision for partnering starts with the same realization as for vertical integration: that digital services become gradually commoditized. According to them, when communication services are broken down into its IT components, they could be seen as: connectivity, hosting, storage, applications, and systems integration. Complexity of partnering involves contracting and to defining what common agendas should be pursued in order to avoid the partnership developing ad-hoc. At the root of challenges related to

partnering, is that it's not a strategy, it's a tool for implementing a strategy, according to Christensen and Raynor. With whom to partner can only be answered after a strategy has been devised.

The earlier mentioned dynamic capabilities view by Teece and Pisano connects Lyytinen and Rose's definitions in classifying how an organisation can align with an ever changing environment, or technological system in the view of Hughes. In this view, firm-specific capabilities are being renewed and embedded in its *processes*, market *positions*, and expansion *paths*.
A challenging task for any industry is to manage the element of mobile technology and its spatial and temporal effects on customer behaviour. There are several active research communities of both commercial and academic researchers[2] examining aspects of mobility and so-called mobile commerce (e-commerce terminated from mobile phones). Nielsen (2006) focuses on mobile service infrastructure and specifically on the interrelations between information infrastructure builders and their institutional context in designing processes. Nielsen also applies this infrastructure view when analysing the design and working of the Norwegian so-called 'CPA' (content provider access), a mobile service platform between 2002 and 2004.

Kakihara & Sørensen (2004) provide a useful taxonomy for how mobility could be understood along three dimensions: locational mobility (geographical movement), operational mobility (capability for flexible operation), and interactional mobility (intensive and fluid human interaction). From an m-commerce perspective locational mobility enables customers to do impulse purchases while on the move, and access the Internet when they are outside their home or office. Operational mobility enables customers to save for example receipts and tickets on a mobile phone. Interactional mobility includes the temporal (time) aspect, which enables a more intensive search and purchase of services until the last minute.

The difficulty of measuring innovation

Measuring innovation has long been contentious and the common approach has been to find proxies of aggregates that lend themselves to quantification and then assess the extent to which they might approximate meaningful changes within particular organizations. Keith Smith (2005)

[2] Such as Global Mobility Roundtable 2002-2011, and Mobile Business …

discusses the issue of measuring innovation with CIS (community innovation survey) and survey based indicators in general and summarise some supposedly robust conclusions that have emerged from the literature as a whole:

- Innovation is prevalent to the economy as a whole, both in low and high tech industries
- Investment in capital equipment constitutes main innovative spending, not R&D
- Small proportion of firms account for high proportion of innovative output
- Collaboration is widespread among innovating firms
- Extension of the CIS to the service industries is important but problematic, and deserves more attention
- There continues to be large differences in collection methods and response rates across countries, making it difficult to compare (meaning that quantitative methods are limited in providing the answers).

Critique of the CIS method to capture services involves amongst other that methods developed for the manufacturing industry is applied to the service sector. Critique also relates to the output analysis and definition of technological change, where it is difficult to capture the often intangible outputs in a heterogeneous sector.

Writing in *Forbes,* Brian Wingfield pointed out that "Although many companies offer financial incentives for innovations, such as patents, it became apparent … that none of the companies represented on the [U.S. national advisory] panel have a single standard by which to measure innovation" (Wingfield 2007). Financial incentives for patenting are a crude approach for other reasons, for example the fact that it cannot take into account the innovative value of learning from failures.

There are two well-regarded approaches used by the OECD, neither of which is entirely adequate for the purpose. One is based on the *Frascati Manual* that focuses on visible inputs and some outputs of innovation, including R&D spending and related indicators, patents and publications from sponsored research. It is based on a rather simplistic linear model of innovation, but the datasets collected are compatible with industry and national accounts so afford considerable scope for comparisons. The other is the so-called *Oslo Manual* that is based on an interactive

model of innovation in firms and was devised by Nathan Rosenberg and focuses on products and processes. Neither of these can deal adequately with indicators of knowledge production, mediation and use (Sirilli 2003).

The *Oslo Manual* (OECD 2011) has been produced since 1992 and includes community innovation surveys published in 1993, 1997, 2001, and 2004 gathered for the EU by Eurostat, EU and some non-European countries (but not the United States). They gathered general information about the firm, about products and processes and the type of innovation, about sources of information for innovation, the objectives and factors hampering innovation. They also collected information about costs, impact, the conditions of research and development, cooperation and on users as well as public policies and the impact on employment, the environment and on the firm's organization. From these data they compiled indicators of the number of innovating firms, the cost of innovation, and the percentage of sales due to new products. Unsurprisingly, they showed that innovation goes beyond R&D and that it does affect the performance of firms, but that the focus on large firms overshadows the concerns of small firms. One effort to simplify is the *European Innovation Scoreboard* (UNU-MERIT 2011) a similar effort to gather data relevant to discovering what characteristics of enterprises are most relevant to innovation effects. It is in effect recognition that the other methods remain partial.

These works leave many things out of consideration, especially in the realm of non-technical innovation that might affect business practices (strategy formation, management techniques, organizational change, marketing, aesthetics, brand management, etc.) The other concern arises from the inability to deal with gradations of innovation by significance, ranging from breakthroughs to marginal changes that might not be generally regarded as innovations at all. However, the most common concern relates to the longstanding complaint about econometric studies generally, and that is that they will assess what is measurable, whether it is the most enlightening indicator or not (Lanjouw & Schankerman 2004).

The OECD *Oslo Manual* emphasises linkages in the assessment of innovation in a manner unusual for measurement practices. They see it as a means of understanding the in-flow as well as the diffusion of knowledge. They make an effort to accommodate the concept of communities of practice as well as more specific forms of collaboration and other forms of co-operation. This

becomes manifest in a table listing a wide range of sources of innovation (from internal R&D and marketing to external commercial sources such as consultants and clients, to public sector sources and general information such as patents and exhibitions). Each source is then indicated to come from a combination of open information, sources for purchase, and through co-operation partners.

The Boston Consulting Group also engage in a project to measure innovation, published as *Innovation 2010* (Andrew et al. 2010) in which they describe the problems associated with corporate metrics. They claim in the 2007 version that "few companies, in practice, rigorously track their innovation efforts from start to finish… Furthermore, of those that do try, few are confident they are getting it right (p. 5)". They also found that most companies tracked five metrics or fewer, with most of the rest tracking only between six and ten. Of these metrics, most monitor the number of new products launched, changes in market share, and incremental sales and profit growth. Measuring innovation inputs was a lower priority, but some firms did measure operating expenses, capital expenditures and the number of full time employees dedicated to specific functions. Fewer closely track the efficiency of their processes, using metrics such as cycle times through specific parts of the process. Most of the firm-level tracking was in the form of project management, as opposed to enterprise–wide measurements and analysis. An interesting finding of the BCG study was that the metrics that have most impact on behaviour included idea selection, optimization of ROI, and minimization of time to market (p. 8). Few companies tied incentive to innovation metrics (p.10 Kleinknecht & Brouwer 1996)[3]. They have also been influenced by studies by Pisano (1997) on project innovation in the pharmaceutical industry, and by (Iansiti 1998) on knowledge indicators for projects.

Other sorts of efforts to account for innovation in the firm go back a couple of decades; indeed they pick up on ideas put forward by Josef Schumpeter earlier in the century but which he failed to quantify. Examples of this include Crepon et al. (1998) who made the effort to correlate innovation and productivity through an econometric analysis at the firm level. While a background in the large scale survey analyses, especially the Community Innovativeness Survey, the UK Office of National Statistics, and the OECD data collected under the *Oslo Manual*

[3] Other references relevant are (Kleinknecht & Bain 1993); M. Rogers & Melbourne Institute of Applied Economic and Social Research (1998);

procedures, there remains a major gap between our theoretical and econometric understanding of innovativeness and practical measurement techniques that can be applied at the firm level. The Boston Consulting Group have made an effort to understand what practices are currently in place (and show that the level of monitoring is very low indeed), but they also fall short of the sort of internal metric that would amount to a panel data analysis of the efficacy of any particular firm's ability to conduct innovative activities over a period of time.

We know that organizational change is crucial and must be dealt with at the same time, but by using different input and output measures.[4]

Concepts of a converging telecom and media industry

The kinds of market opportunities that are potentially significant to communications firms in new services are fundamentally aspects of convergence. This chapter will address concepts related to our second research question how new services can be packaged and the role of platforms in so called two- or multisided markets, affected more or less by various standards, institutions and regulation.

The telecom industry has increasingly applied existing Internet protocols and framework for traffic on their networks rather than developing proprietary ones. Christensen and Raynor (2002) describe how convergence is the result of recombining components of separate industries into a new value chain. A new level of interdependence is often created, acting as an opposite force towards the earlier mentioned idea of "structured dialogue". However, in order to establish interoperable standards, modular interfaces between technology components are eventually provided by single firms or groups of firms. This creates opportunities for firms to support a value chain with efficiently integrated partners and suppliers. According to Hughes (Hughes 1983) innovative efforts will focus on reverse salients (bottle necks).

[4] The essay by Keith Smith, ("Measuring Innovation" in J. Fagerberg, D. Mowery and R. R. Nelson, *The Oxford Handbook of Innovation* Oxford, 2005 pp. 149-177) provides a general summary, with special emphasis on studies that have used the CIS and other major databases. He also emphasises the shortcomings of this literature, its inadequacy for policy advice and strategic planning, but provides excellent guidelines on what possibilities there are for using such resources.

The different layers in the Internet protocol architecture is described by the so-called TCP/IP model (Carpenter 1996). TCP/IP is a framework for computer network protocols developed by the US Department of Defense and uses four abstraction levels: Network access layer, Internet layer, transport layer, and application layer. In the mobile service context, the network access layer deals with how the mobile phone's radio transmitter connects to the network, how the device is identified on the network, and how hand-over takes place in case of roaming between networks. The Internet layer (also called the Internet protocol layer or IP layer) solves the problem of sending packets across one or several networks involving routing (sending destination data to the receiver's end). Host addressing and identification is done with IP addresses. The Internet layer could therefore be seen as an envelope containing the application data and the receiver's address written on it. Routers and switches operating on the Internet layer typically do not open the "envelope" to look inside for the application data. Rather, the Internet layer just provides the (bit) pipe to deliver the envelope to its destination address. The transport layer is a transport mechanism providing functions such as disregarding data being duplicated, traffic congestion control, and resending lost packets. End to end transport could be either *connection-oriented* as in the Transport Control Protocol (TCP) typically used for emails and file transfers, or *connectionless* (typically used in streaming and video applications) as in the User Datagram Protocol (UDP). The application layer refers to high-level protocols utilized by respective application such as FTP (file transfer protocol) or SMTP (simple mail transfer protocol).

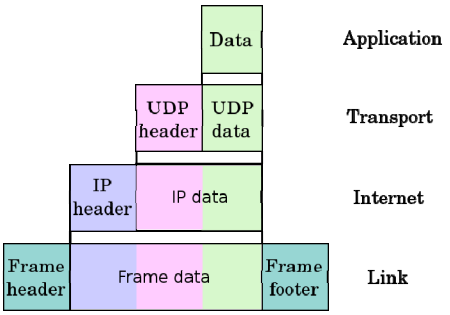


Figure 5: The TCP/IP model, applied on UDP data (Wikipedia 2008)

As the TCP/IP model divides applications from the underlying transport mechanisms on the network it therefore provides a model for how different firms can operate in parallel on different layers. This is in stark contrast to how telecom equipment manufacturers used to deliver "black

boxes" to carriers for specific tasks, such as SMS services, where telecom operators managed the service end-to-end over their own networks by themselves.

Shapiro & Varian (1999) describe how consumers value information technologies that are widely used, just as they value communications networks with broad reach. Positive feedback works to the advantage of large networks and against small networks. Margin production and distribution costs are negligible for volume production once the first information good is produced (e.g. a movie or software package). When choosing terms and conditions for the product, restrictive terms and conditions tend to raise the value of a product to consumers, but reduce the numbers of units sold. They further describe how in a differentiated (no dominant design present) information products industry, firms must add value to the good, thereby distinguishing from the competition. Differentiation of products could be difficult when copyright and patents are hard to get and competitors can copy design and features within months. On the other hand, cost leadership through economies of scale and scope is easier to explain to customers once a dominant industry design or standard has evolved. To achieve and keep cost leadership, distribution skills, marketing expertise, and channel control are critical. Network building alliances between firms are important to ignite positive feed-back from users. They describe three types of such alliances: Special interest groups (cross-licensing of patents), alliances where members can access standards, and alliance around a central actor who collects royalties. Partners in such alliances would negotiate over control of the existing installed base, technical superiority, and intellectual property rights. Digital technology modifies the economic rules also by posing challenges to rights management as it reduces cost of making copies and allows for quicker and cheaper distribution.

The network perspective emphasises cooperation, but the inevitable reality is that in every exchange relationship lurks a potential conflict between the actors. Thorelli (1986) defines the domain of any organization in five dimensions: Product (or service) offered the environment, clientele served, functions performed, territory, and time. If there is a total domain overlap between two companies in these five dimensions, a head-on competition exists. Complete overlap implies competition and partial overlap implies good networking possibilities.

Grindley (1995) describes how standards change the economics of networks and the rules of competition. First of all, expanded network externalities reduce the uncertainties for participants. It also reduces consumer lock-in (provide a wider selection of compatible products) and gives incentives for participating companies to compete for growing the whole market and gaining new customers. The choices of competing on price versus features are also affected as standards often induce dominant designs. A choice for firms to compete with standardised components emerges, at the same time as options for systems offerings of components, and a market for proprietary extensions will still be viable strategic options.

Inspired by von Tunzelmann & Fai (2001) we will consider convergence on four levels in our analysis and apply it to mobile service delivery:

- Industry level: Technical interfaces between fixed and mobile service delivery platforms; industry interfaces between the media, IT, and telecoms industries.
- Firm level: Organisational boundaries in the delivery chain
- Product level: Boundaries between product markets, e.g. markets of mobile music downloads and digital event tickets)
- Technology level: Interfaces between mobile delivery components

Platforms

Evidence from the semiconductor industry suggests that firm resources predict entry into new subfields. Kim & Kogut (1996) found that firms with previous experience in industry segments that utilized general purpose "platform technologies" were more likely to enter into new subfields. One such platform technology is operating systems (OS) in the PC world, which has provided fertile ground for well-known platform battles between Microsoft's Windows and Apple's Mac. For mobile phones, a more diverse selection of OS is available to users with Nokia's Symbian, Google's Android, Blackberry's Blackberry OS, Apple's iPhone, Microsoft Mobile, and a few Linux based OS.

Baldwin & Woodard (2008) outline the utility of the platform concept in academic research:

> "A benefit of viewing platform architectures in a unified way is that theories and observations of seemingly disparate phenomena in diverse fields can be brought into focus as part of a coherent whole."

They also outline how the concept of platforms has been used in scholarly work since the early 1990s: Product development researchers described products that could be modified by adding, substituting or removing features. Technology strategists then identified platforms as points of control in an industry, dealing with issues of platform competition and market leadership (Cusumano and Selby; Cusumano & Selby 1996; Gawer & Cusumano 2002). Industrial economists then adopted the platform concept to characterize transactions between two or more groups of agents (Rochet & Tirole 2003), cross-subsidising between groups (Parker & van Alstyne 2005), and competitive dynamics (Evans et al. 2006).

Gawer & Cusumano (2002) point to two fundamental phenomena impacting platform actors: the increasing interdependency of products and services; and secondly, the increasing ability to innovate by more actors in the high-tech world. According to them, it raises amongst others the strategic question of how to achieve market leadership in platform environments. This challenge is in many ways different to those faced by companies in the past, according to them.

Platform architecture has roots in engineering design and one example of this is object oriented programming. In object oriented program languages like Java, reusable classes and objects are created. In such software design, platforms on a higher abstraction could be seen as generic objects, visualized in modeling techniques like the unified modeling language (UML). UML visualizations assist in the design process of software including diagrams depicting use cases, classes, interactions, states, and sequences (Jacobson et al. 1999) made up of reusable objects.

The architecture behind platforms is described by Tushman & Murmann (1998) as being portioned into a set of 'core' components with low variety and a 'peripheral' set of complementary and high variety components. Baldwin & Woodard (2008) define platforms as long-lived elements of the system that establish rules and interfaces for interaction among the different parts. Any platform system could be divided into three parts:

1) the complements, which exhibit high variety and high rates of change over time;
2) the core components, which remain stable as the complements change;
3) the interfaces, which are the design rules that allow the core and the complements to operate as one system.

Both the core components and the interfaces are relatively long-lived, hence part of "the platform". The combination of stability and variety in the architecture makes it possible to create novelty without developing a whole new system from scratch. Thus platform systems are evolvable. The case of the PC shows that interfaces could be more long-lasting (BIOS, OS, and input/output systems interact in a similar way as in the 1980s) than actual hardware implementations that have changed dramatically during the same time.

Gawer (2008) suggests that platforms could be divided into three groups: internal, supply chain, and industry platforms respectively. The expected benefits of product or internal platforms in the literature are supposed to be fixed costs savings, the ability to produce a large number of variants, and flexibility in products design. A supply chain platform supports several firms working in a system towards an end product or service, common in the automotive industry. Industry platforms provide a foundation for other firms to build their own products or services, as in the case of operating systems, on top of which application firms can provide and market their own products, rather than just being part of a chain, as is the case with a supply chain platform. Gawer further points to the challenge in studying service platforms and that further research needs to be done, as the vast majority of case studies have focused on products:

> "Services do not lend themselves to being neatly decomposed as subsystems and component as products do. The division of labour between component makers and assemblers, and the battle of power between them, so crucial to platform dynamics, has therefore to be reinterpreted in the context of services…"

Cusumano & Suarez (2009) claim the role of services has often been neglected in studies of platform leadership and the establishment of new services. They point to the fact that innovation literature such as von Hippel's work, Abernathy and Utterback focus on the role of users, technology architectures, and industry life cycles without referencing much to services:

> "Although some of the more recent treatments of platforms do include service industries…there is still a vacuum when it comes to analyzing the role of services in helping to establish product-based platforms"

Suarez and Cusumano further argue that the ability for firms to provide services on their own or to line up a network of service providers serves several functions:

> "Services can reduce the risk to customers of adopting a new platform, provide feed-back for further innovation, or enhance the value of the platform through integrations with complementary innovation or other platforms.. Furthermore, in mature markets or product markets particularly vulnerable to price competition and commoditization, services can provide an important source of revenues and profits. Platform firms are likely to dominate the provision of services in early stages of the market, before adoption of the platform has become common, or when the services require special knowledge of the platform architecture and technology, such as when the platform is not highly modularized."

Gawer (2008) claims that "a dominant firm in the OS market would most likely affect competition, industry innovation and perhaps even social welfare" and continues:

> "Platforms invite us to examine carefully the intimate interactions between technology and business, and in particular between the structure of technology and the modalities of business interaction"

'Structured dialogue' (as described earlier by Christensen et al.) would be a prerequisite for a platform to be integrated into a modular design, sometimes partly or wholly standardized. Modular interfaces could decrease coordination costs in a technology system, but the platform designer could lose control over profitable elements as IBM discovered when releasing the OS interfaces to Microsoft and Intel in the early 1980s.

Economides & Skrzypacz (2003) discuss the formation of technical standards platforms in industries with network externalities. Where firms are free to choose their degree of technical

compatibility with competitors, the strength of network effects would decide the structure of coalitions and competition:

> "In adding itself to a technical standards coalition, a firm benefits from the network effects of the whole coalition, but also faces increased competition in the output market from other firms in the coalition… We find that the extent and size of coalitions at equilibrium depends crucially on the degree of the intensity of network effects. When network effects are very strong, full compatibility prevails. When externalities are slightly weaker, two standards coalitions are formed, a singleton, and one with all remaining firms. On the other extreme, for very weak network effects, the equilibrium is total incompatibility, and for slightly more intense network effects, coalitions are of small size."

If the standard is part of a platform, a platform-mediated network of firms could be seen to exist around a standards coalition. Eisenmann et al. (2009) describe how rights holders to such standards within a platform do not necessary mediate transactions, but could be seen as platform sponsors. Further, they describe how various strategies exist for managing openness (freedom or participation) for different participants in the platform: demand-side users (end user), supply-side users (application provider), platform provider, and platform sponsors. Horizontal strategies include licensing, joint standard setting and technical interoperability with rival platforms. Vertical strategies include backwards compatibility, platform and category discrimination, and absorption of complements.

Le Masson et al. (2009) describe various constellations for defining and developing the platform "core". Collaborations for platform design have to deal with at least three processes according to them: managing value creation; organizing knowledge production and learning; managing the interests of each of the partners. Platforms can originate from a group of firms (what they call platforms for platforms) or be led by a platform entrepreneur. Groups of platform-producing firms will get together when each actor lacks some capabilities and is unable to produce it alone, when none of the actors have a clear view of the value landscape, and the design process itself reveals missing competences in unknown areas. Firms could be looking to combine new platform technology with complementary asset appropriation (Teece 1986) and divert interest from the creation of common interests. Once a platform develops into an industry platform it is not

necessarily the technical/design leader who provides platform leadership in the market, as it could be delegated to one or several other actors .

Parker and van Alstyne (2005) discuss how firms profitably can give away free products. Even in the absence of competition firms can rationally invest in a product it intends to give away into perpetuity, due to the low cost of information, and the ability to raise profits on the other side of the market. They also claim that product coupling across markets can increase consumer welfare even as it increases firm profits because the firm cannot internalize all benefits from externalities benefitting consumers.

Ballon & Walravens (2009) define different types of platforms in the mobile service industry characterized by control over assets and control over customers respectively:

	Control over customers	**No control over customers**
Control over assets	*System integrator platform (Apple, Ovi, i-mode, Vodafone Live)*	*Enabler platform (Windows Mobile, Android, Brew)*
No control over assets	*Broker platform (Handango)*	*Neutral platform (LiMo)*

Figure 6: Platform control over assets and customers (Ballon & Walravens 2009)

They also define "gatekeeping" roles among actors as follows:

- *Service Creation:* Service creation may be browser-based, or based on platform agnostic programming languages.
- *Identity & Profile Management*: profile and identity information is gathered by advertisers and network operators. The network operator could provide access to profile management components like the user's location or context information.
- *Service Provisioning/Brokerage*: Aggregators and middle-men often provide services to end-users that originate with a content holder that lacks ability to delivery to a mobile handset.
- *Charging & Billing*: the operator provides a billing component that sometimes is available to third-party service providers. For the end user no direct billing relationship is apparent

when services are provided by an advertiser, but quite clear when the operator is charging for content access.

Multi-sided markets

The concept of multisided-sided markets is a concept where one or several platforms facilitate interactions between users on two or multiple sides of a market. It provides a way of analysing converging markets and several academics discuss competition and mediation between such markets (Armstrong 2006; Bhargava & Choudhary 2004; Rochet & Tirole 2003).

The concept of two-sided markets was first used by antitrust cases concerning the credit card market in the US and the development of business models in the "new economy" in the 1990s (Bourreau & Sonnac 2006). A multi-sided market features one or more platforms bringing together two or more groups of consumers that are independent of each other. This results in indirect externalities in a two-sided market. Evans (2003) defines a two-sided market in the following:

> "At any point in time there are a) two distinct groups of customers; b) the value obtained by one kind of customers increase with the number of the other kind of customers; and c) an intermediary is necessary for internalizing the externalities created by one group for the other group".

Compared to classic transaction cost theory and Coases's theorem (Coase 1937), the transaction between two parties on a two-side market only takes place in the presence of a third party, the platform. A Coasian neutral price through direct bargaining between the two agents is therefore not possible. Since there is no pricing neutrality, platform strategies could be based on price allocation between the two markets, rather than conventional cost-based pricing.

Industry dynamics and technical innovation is taken into account by using the concept of platforms and the economics surrounding platforms. Further, the two-sided market model provides different conditions for pricing compared to one-sided markets, which are an important

aspect of business models available to platform providers. Below are a few examples of two-sided markets:

Buyers	**Platform**	**Sellers**
Gamers	Video game platform	Game developers
Users	Operating systems	Application developers
"eyeballs"	Portals, newspapers, TV	Advertisers
Cardholders	Debit and credit cards	merchants

Table 2: Examples of two-sided markets

Not all two- or multi-sided markets are made up by industry platforms, according to Gawer (2008), who defines an industry platform as inducing innovation. Such industry platforms are building blocks that act as a foundation upon which other firms can develop complementary products, technologies or services. Some multisided markets are pure exchanges or trading platforms with a sole purpose of facilitating transactions without the possibility for other players to innovate on complementary markets (for example a commodity exchange or stock exchange, where identical assets are traded). Gawer further points to a gap in the multisided market literature as it often focus on how an existing platform facilitates exchange through pricing in a multisided market, rather than the dynamic and innovative process whereby platforms are *created* and the markets with them.

If a firm launches and controls a platform involved in a multi-sided market, the scope of the platform is significantly wider since it controls not only pricing, product design and technology, but interactions that do not happen at the firm's boundaries. In this way we could depict how the concept of innovation at the borderlands could be seen as being extended to borderlands of other firms as well.

As a mutual dependency exist between the two markets, a profit optimization would strike a balance between number of users and price on both sides, where one side could subsidize the other. Take the example of a mobile site portal (i-mode in its initial years e.g.), the balance to strike for the platform owner (NTT DoCoMo in this case) is to have an attractive price for users (max 300 yen in this case), while maintaining an attractive revenue share for content providers

(9% in this case). This price allocation between the two markets has certain basic characteristics (D Evans 2003):

- Elasticity: if the installed based on one side increases and if this side is captive, it is profitable for the platform to increase its price in order to decrease its price on the other side and attract more users.
- The content provider's market power: if content providers enjoy significant market power, then the platform could decrease its price it charges those service providers to attract more content providers leading to more customers.
- If users could be seen as opportunistic lead users towards competing platforms, their presence has a high value for web sites and thus modifies the price structure. Platform providers could then lower prices for users and increase them for content providers.
- The consequence of multi-homing (users connecting to multiple platforms): Price sensitivity appears to increase on the user side, but various scenarios could occur.

According to Evans (2003) other factors impact the price structure such as investment on one side of the market. Further, multi-homing and monopolistic effects related to the platform have an impact on policy strategy.

As a platform owner, strategic questions related to the business model arise in the two-sided market approach:

- How to attract demand in both sides of the market, and what the critical install base on each side is?
- How to estimate the demand elasticity in order to determine which side of the market should be subsidized by the other?

Waverman (2008) points out that demand-side externalities of information economies include the effect "tipping". As a provider of technology solutions, a tipping with your own products could mean significant market power. As prices also don't need to cover costs in a two-sided market, tipping means significant opportunities to subsidise new users, and propel a positive feed-back effect. The value per user increases due to application providers joining the bandwagon. Platforms could therefore be seen as being in constant evolution together with its environment, and lower the cost of innovation at its periphery.

Boudreau & Hagiu (2009) claim from case studies that firms with platforms connecting multisided markets serve as rule-making governance mechanisms and suggest more studies are needed:

> "…our findings point to deeper questions necessary for understanding the economics of non-price mechanisms used by multi-sided platforms… The sheer number of and complexity of instruments being used by platform owners (including investments, technology rules, information dissemination, contracting choices and pricing) is also clearly an empirical phenomenon deserving closer attention and clearer explanation"

They also point to important managerial implications as the scope of strategy for platforms is not limited to pricing, product design and technology "but critically include control over interaction that do not happen at your firm's boundaries". Secondly Boudreau and Hagiu mean that their analysis "reveals the existence of a wide array of strategic instruments available to implement platform regulation, including non-contractual, technological and information design". Their analysis also suggests that the consequences of platform regulation develop over time.

Jacobides et al. (2006) and there notion of how firms can control "bottlenecks" determine how value is distributed. Firms can position themselves to create bottleneck ownership and therefore benefit and control architectural innovation in an industry. In the larger picture it means that firms could strategically re-shape the structure of the sector. The two factors of complementarity and mobility capture different economic effects: Complementarity influences the size of the value to be bargained over (some combinations yield higher value, others lower value, depending on their "fit"). In contrast, mobility influences the bargaining power of the asset holders, and thus the division of the value: Some assets cannot be replaced whereas other assets can be replaced by numerous equivalents at negligible cost. The key insight is that while imitation by competitors may reduce profitability, it also increases the value of the underlying assets (such as the core elements of a platform). Jacobides et al. (2006) claim that to see how imitation can create value for a platform owner we have to shift away from a narrow focus on profiting from innovation in terms of operating results, to a broader consideration of changes in relative prices induced by innovations. In this sense mobility and complementarity among platform components could be seen to affect the prices offered in a multi-sided market.

Christensen & Raynor (2002) discuss three generic options for communications firms acting in multisided markets: First that non-core activity should be divested. This means dismantling of telecom operators into a set of division such as network business, product innovation business, and customer care. The abundance of virtual mobile operators has sometimes been used to support this view. In essence it is claimed that such virtual operators focus on customer care and leave network operations to others, as in the case of Virgin Mobile in the UK (utilising T-mobile/Orange's network). A second view is that increased vertical integration is required in order for communications firms to grow. This view holds that in order to avoid commoditization, companies that provide access services also needs access to "content" (i.e. sports licenses, games production, movie studios or the like). The emergence of large media conglomerates like AOL Time Warner, Vivendi-Universal was seen by many as proof of the wisdom in this approach.

> *"I don't want to be anyone's dumb pipes. If all you do is racks and servers that's dumb. What we're doing is melding the network and the content."*

Source: Leo Hindery, CEO of Global Crossing, quoted in The Industry Standard, Mar 27, 2000 (Krause 2000)

Finally, some argue a third way combining the efficiency of focus with the power of integration. This view holds that through an extended network of partnerships, firms can be agile and adaptive, but still have access to specific technologies and expertise when needed. Each of these approaches solve some problems, but none of them alone solve how firms can grow their turn-over and ultimately create increased value to its owners, according to Christensen & Raynor (2002): As diverse companies focus, they tend to accumulate incremental efficiencies. Consequently, splitting up one big company with a growth problem creates several smaller more efficient firms with growth problems. Vertical integration in order to secure market power will not be successful in securing growth where it doesn't serve customer interests. Partnerships tend to run into trouble because instead of offering the best of both worlds, they often cause the opposite: ill-defined agreements that restrict a firm's ability to act without the offsetting advantages of true control over potentially market-changing assets. Each class of conventional wisdom – focus, integrate, partnering – fails in itself to address the underlying growth problem, as underlying capabilities and not structure decide the ability to seize growth opportunities, according to Christensen and Raynor. As communications firms during the first decade of the century have pursued growth opportunities, they have found them within new services demanding a deep understanding of linkages between organisational form and technological capabilities.

Institutions and regulation

The following aims at describing the institutional environment for regulatory and policy decisions, which is highly influential in the telecom industry as a whole. It will also help us to elaborate on or third research question and the role of self-regulation which has been an important part of the fast moving mobile telecoms industry, especially among mobile services and platform industries.

Economides (2003) concludes that Telecommunications has significant regulation. "…Railroads, electricity, air and ground transportation are also heavily regulated. Financial exchanges are under 'light' regulation and to a significant extent under self-regulation. In contrast, B2B exchanges, credit card, and banking networks, as well as computers and their virtual networks are almost completely deregulated". So why have telecom regulation? The logic of competition law according to Economides (2003) is that efficiency (allocative, productive, and dynamic) is

achieved through antitrust policy, and competition is the means to achieve it. Economides further claim that telecommunications qualify under four criteria in which regulation is appropriate: where competitive outcomes cannot be achieved by market forces; where deviation from economic efficiency is deemed socially desirable; where the social and private benefits are clearly different, including cases in which minimum safety standards increase social welfare; and to allow for coordination in technical standards or market equilibriums. Telecommunications can qualify under all four of these criteria as an industry in which some form of regulation is appropriate.

The nature and form of regulation regime vary between nations and industries. The interactions between regulation, intellectual property laws, and international standards provide an institutional framework for the analysis of innovation in the telecom industry.

Mark Thatcher's book "The Politics of Telecommunications" (Thatcher 1999) presents an analytical national framework to describe how a country's institutions influence policy formation, and the main reference for our chapter on institutions and regulation. His analytical framework provides a set of hypothesis concerning national institutions and aids in defining key terms. In this thesis (international) industry standards associations are assumed to take on some of the institutional behaviour found in national institutions. Thatcher uses static frameworks centred on national institutions and public policy. It is built on national institutionalism theory (Powell & DiMaggio 1992) and assumes two important sets of regularities over historical periods: Firstly there are significant continuities in nation's policies and policy formation, lasting for decades or longer. Policy making is characterized by persistent logics, rules, and strategies. Evidence for this are enduring policy making, direction of policy, public decisions etc that can be seen in the economic performance (e.g. economic growth, income distribution) of nations. Secondly there are large-scale differences in policy making and economic achievements between nations. Analysis shows that strategies, ideas and self-defined interests among equivalent actors differ from country to country. Also the relationships and distribution of power between actors differ. Even if groups have similar resources, their power over policy varies. Therefore Thatcher (Thatcher 1999) is of the opinion that

> "…institutionalists argue that the behaviour of participants in decision making cannot just be read-off the characteristics of those actors"

The concept of institutions can be widened to include the structure of firms and markets and their relationship within the state. It can therefore be argued (Hall & Tayor 1996) that institutions exist within society and the economy as five "organizational" variables: the organization of capital, labour, the State, the political system, and the position of each country within the international economy. With these five variables the influence of the national institutions can be seen simmering down on all levels of the economy and firm strategy.

National institutions affect the values, aims, and perceptions of actors, who are seen as flexible, malleable, culture-dependent and socially-constructed (March & Olsen 1984). National institutions affect the strategies of actors. Actors with similar aims and resources but facing dissimilar national institutions, choose different strategies and patterns of behaviour. National institutions also affect the "rationality" of decision making. Institutional contexts affect the expression and organization of interests among actors. The distribution of power between groups depends not only on resources, but also on institutionally-determined opportunities for using the same resources. National institutions are more or less autonomous from the state, restricting governments more or less to implement certain policies. National institutions affect the interests and preferences of actors (as mentioned above), but economic performance through regulation, legal contracts, and purchaser/provider of services, can be singled out as especially important.

National institutionalist explanations don't claim "institutionalist determinism", it rather structure decisions and offer the framework within actors operate.

Changes in policy takes three shapes according to Thatcher (1999): First, policy changes from external factors within the framework of existing institutions can take place, as institutionalist determinism is rejected. Secondly the institutions themselves can be modified, and thirdly, national institutions themselves can influence non-institutional pressures for change.

“Path dependency” affect outcomes that are not wholly determined by original forces for changes, but are dependent on the path followed. Policy feed-back offers one mechanism for path dependency, i.e. over time existing policies feed-back on State capacities, identities, goals, and capabilities of social groups.

In the following we arrive at the strand of actors and institutions: Organisations are epitomised in a form that is different than institutions, and can be defined in terms of their relation to jurisdiction and legitimacy. Selznick’s core assumption is that organisations, apart from being tools, also have a life of their own (Selznick 1957). The organizational structure can adapt to the environment and internal pressure in order to sustain its own existence. Over time, critical decisions in companies affect the structure itself, and lead to “institutionalization”.(Berger & Luckmann 1967) expanded institutionalisation to a process that gives actions meaning and that social reality is constructed by humans. (Powell & DiMaggio 1992) saw institutions consisting of two dimensions: Technical and Institutional. The technical dimension is work technology and operating requirements controlled by rationality and efficiency. The institutional dimension constitutes norms and expectations from the outside of how an organisation should be. (Scott 1995) identified three different forms of institutional pressures (isomorphism): Mimetic isomorphism is when organisations copy organisational behaviour, such as marketing strategy without clear evidence of performance improvement. Secondly, isomorphism is coercive and stems from informal and formal pressures from institutions and organisations in the environment, such as regulators, government agencies or main customers. This isomorphism can force organisations to adapt new procedures. An example is organisations being forced by customers to certify and prepare documentation according to ISO quality systems. Thirdly, isomorphism is normative. Organisations change because they want to achieve standards of professional behaviour. Universities, consulting firms and standards consortia impose professional views on standards. Organisations adapting institutional isomorphism move towards similarity to gain acceptance from the environment, rather than just focusing on internal efficiency.

In this study it is assumed that national institutions are stable and change only slowly. On the contrary, if national institutions change easily, the clear distinction between policy and institution disappears, as institutions would be reduced to an endogenous variable for actors who want to change the course of policy and reform.

As an example of policy making Economides (2003) discusses anti-trust issues and national regulation. According to him inequalities of market share in a network is normal, due to network effects and the winner-takes-all logic of a network economy. He further claims, in a US context, that the legal framework for dealing with anti-trust issues in a networked industry is not enough founded in economic principles and analysis of network effects. One goal of the regulator is to further innovation, and he comments on the difficulty for a policy maker to address this (Economides 2003):

> "An important antitrust issue is the speed of innovation in a network industry as affected by strategic decisions of firms and potentially anticompetitive actions. The effects of actions on innovation are important because innovation affects the welfare of future consumers, and this should be taken into consideration in an antitrust action. The difficulty in dealing with innovation issues in an antitrust action arises from the fact that the efficiency and intensity of innovation in monopoly compared to perfect competition and oligopoly are open questions in economics. Thus, it is very hard to make general statements on innovation in an antitrust context."

The implications from this lack of clear rules in the market place are amongst others that continuous interaction between the firm and the policy maker provides mutual understanding of regulatory issues. This also leaves considerable room for the firm to affect the policy maker through lobbying. The process of affecting policy through lobbying is an investment choice for corporate actors. It is a strategic investment just as acquiring a new production facility, or investment in new product development would be. As a managerial option, affecting policy through lobbying is an important concept, because it describes the bridge between the firm and the external environment on the national level, as this strategic investment would be an integral part of the business model. Large firms normally have public relationship staff devoted to this task, whereas SMEs normally leave it to industry organizations to act on their behalf.

The implications for a mobile payment service provider is a choice between investing in superior delivery technology, or it might choose to influence government policy and choices, so that only a limited set of delivery technologies are being made available. In other words, one firm could

affect the national policy maker in a way that a competitor's solution becomes illegal (or proposed solution if part of a standardisation process). In the US, EU and Japan, the strategic choice of lobbying the policy maker has been utilised extensively by incumbent operators (who in many cases are difficult to differentiate from the policy maker, as many governments have significant ownership in them): delay of portability of numbers, affecting network interconnection charges, or how much an incumbent could charge mobile virtual network operators for using their network.

Shapiro & Varian (1999) discuss information policy from the perspective of the firm, in tactic terms: No executive in the technology sector can ignore the government's role in the information economy, according to them. Further, they claim that policy makers must have sound understanding of a competitive strategy in the network economy to shape policy. In telecommunications regulation, the government's role will not diminish in the near future, so firms need to know the rules of competition, as competition policy is intended to ensure a fair fight, not to punish winners or protect losers. Mergers and acquisitions involving direct competitors are subjected to careful review by the respective justice departments and trade commissions. Firms shouldn't be afraid of cooperating with other companies to set standards and develop new technologies, so long as the efforts are designed to bring benefits to consumers. Further, companies have considerable freedom to engage in differential pricing. But corporations being fortunate enough to gain a leading share of the market should be sure to conduct an audit of their practices, in order to foresee interaction from policy makers.

Business models

A conceptual view

Only recently has the study of business models moved beyond popular journalism and general management education into the realm of serious analysis. In this section we will review the theoretical underpinnings of business models and integrate the previously reviewed innovation and platform literature in order to describe how firms through their choices of technology and business model can affect an industry's structure. Much of this has come from the effort to refine large sets of business models for comparative purposes, and we extend this sort of thinking for our purposes of assessing differing innovation activities in differing business models. One

underlying motive for this is to be able to show what dynamic characteristics business models have, and what tools and mechanisms there are that allow for shifts. Another purpose is to differentiate the commonplace concept of business model as, for example, a narrative presented to a lender for the purpose of explicating how a business idea is supposed to work, from a set of analytic elements that can be used to show where innovative activities occur.

In this section we do two other things. The first is to provide a new way of thinking about the ways in which business models can express relationships among firms and show how the interfaces (commonly expressed in the form of contracts or longstanding trading relations) define such models beyond the firm. The other is to take this approach and apply the concept to networked relations. This is especially useful to assess the ways in which standards get applied within networks, the role of platforms, and beyond that the sources of coherence of business systems. Ballon (2009) supports the view that business models are useful concepts to link technical architectures of firms to business architectures for analysis at a value network or industry level.

The inherent value of an innovation remains latent until it is commercialized, and it is crucial for technology managers to find the "architecture of the revenue" (Chesbrough & Rosenbloom 2002) as early on in the development process as possible. The concept of the business model has different definitions and interpretations among business practitioners and researchers. Our view of the business model starts with an incremental approach to strategy, which connects to evolutionary economics theory. The business model could be set in contrast to strategy in at least three aspects. The business model assumes that knowledge is cognitively limited, whereas strategy formation assumes access to reliable information. The business model focuses more on value for customers, and less on competitive threats to returns. A business model focuses on value for the business, whereas strategy focuses more on shareholder and financial value.

The logic of an established and successful business model could also constrain an organisation's search for new alternative business models, described in the literature as establishment of a "dominant logic" (Pralahad & Bettis 1986). Habits of established routines and dominant logic confines the firm in various ways: local search relying on basic routines, learning processes being local and path dependent (Nelson & Winter 1982), bounded visions among managers meaning

firms may differ greatly in their perception of new opportunities (Fransman 1990), or innovators losing out to imitators due to lack of complementary assets (Teece 1986). Established business models become embedded in the organisation, which is described as the "success breeds failure syndrome" (Starbuck et al. 1978) that disadvantages established industry leaders when challenged by start-ups with new and transformative technology. It could also affect the firm's absorptive capacity negatively (Cohen & Levinthal 1990). To overcome limited information and bounded visions in new technology development some scholars propose firms to invest in integrative capabilities (Rebecca Henderson 1994), complimentary assets (Tripsas 1997), and manage disruptive technologies outside the main business (Christensen 1997). Integrative capabilities are competences spanning organisations, which takes time to establish, as they are the product of many individual management decisions over time. Complimentary assets could be external integrative capacity, and the maintenance of geographically dispersed research centres. Managing of transformative (and disruptive) technologies keeps the organisation involved in alternative value networks. Innovation in a technology system could act as competence-destroying or competence-enhancing for firms as new 'dominant designs' emerge (Tushman & Andersson 1986). Limitations in a firm's ability to autonomously evaluate business information could lead to 'strategic convergence' (Hamel 2002), i.e. firms imitate each other. Successful business models get imitated by firms that do not understand that the strategic process involves designing a custom strategy or business model for the specifics of each situation that involves dynamic capabilities. Firms involved in strategic convergence typically underestimate the difficulty of replication and imitation of dynamic capabilities. Finally, if a company does not have an already sufficiently developed level of technological knowledge in a specific field, it turns out to be extremely difficult to absorb newly acquired knowledge into its own technological core.

Legal scholars describe how to control and regulate the Internet against abuse while keeping its innovative capacities (Lessig 2001; Benkler 2006);others explain business models in terms of "control" and so-called control points when describing how firms maximize profits (Trossen & MIT Communications Futures Program 2005); Jacobides et al. (2006) describe how firms can affect an industry structure through "bottle neck" ownership.

. A generic business model with the following units of analysis can be defined and used to develop action-plans and pinpoint certain critical components within the organization Hedman & Kalling (2002):

1) customer

2) competitors, e.g. are relations to customers long-term or short-term, do both parties share information, or is it simply a money transaction.

3) offering, (services and products have a certain price, cost, support, service, quality, consists of bundled products)

4) activities and organization,

5) resources,

6) factor and production input suppliers, and

7) the managerial and the organizational, longitudinal process component. It covers the dynamics of the business model in time for cognitive, cultural, learning and political constraints on logical changes in the model, as illustrated in the figure below:

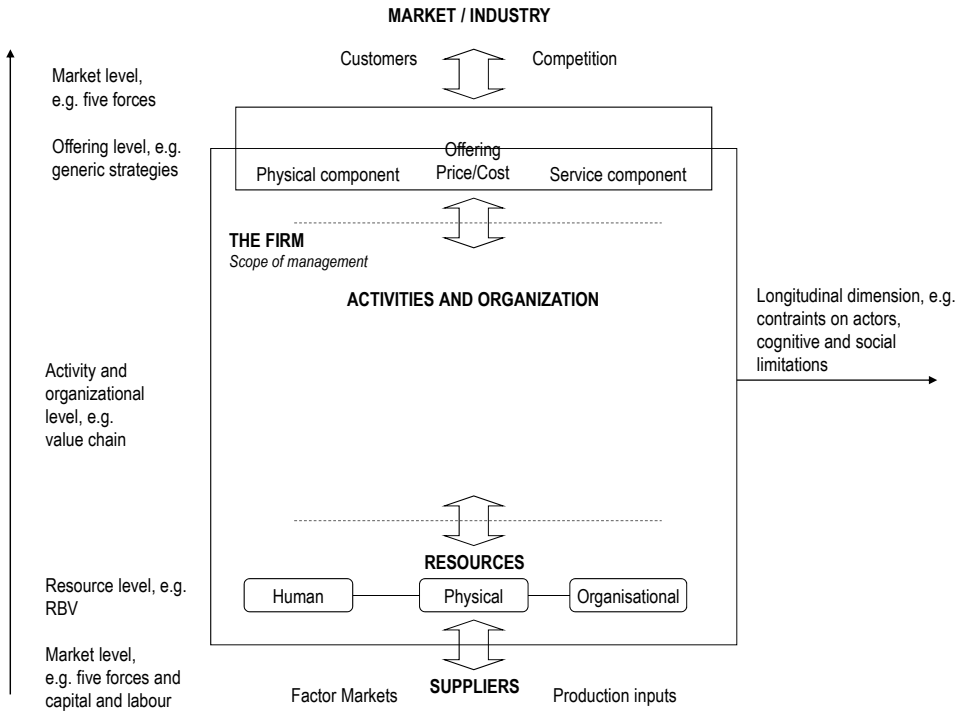


Figure 7: The structure of the business model (Hedman & Kalling 2002)

Customers and potential customers are part of the market network and can be assessed to see how their needs affect the offering and other components of the business model. Suppliers can be potential competitors. The relation with customers is an indicator of current and future business potential: personal or anonymous, long or short term. Is there a knowledge exchange or only money transactions, is there visibility into the supplying firm regarding cost structure, price policies, technology, and research? Understanding the competition calls for understanding the competitors. Separating competing products from competing substitute products could be difficult. Scale and size, product range and innovation, degree of differentiation, cost structure, competencies, value chain configuration, organizational structure and their ability to raise switching costs, could all be parts of a detailed business model, according to Hedman & Kalling (2002).

For organizational analysis, the structure of the organization, its control and coordination, relation to other organizations, and industry structure must be understood. The division of labour can be done through either a generalist or a specialist approach (for example by departments that specialise in certain tasks) or through input-based versus output-based approaches (considering the objective of the task, such as by products or customer segments). Division of responsibility and hierarchy, openness for internal learning, geographical proximity (Saxenian 1994) and inter-department communication also affect the capability of the organization that can be mustered into the business model.

The same firm can have multiple business models for different markets or product segments. The same business model is also part of a network of more or less active stake holders. A summary of corporate stake holders are summarised below:

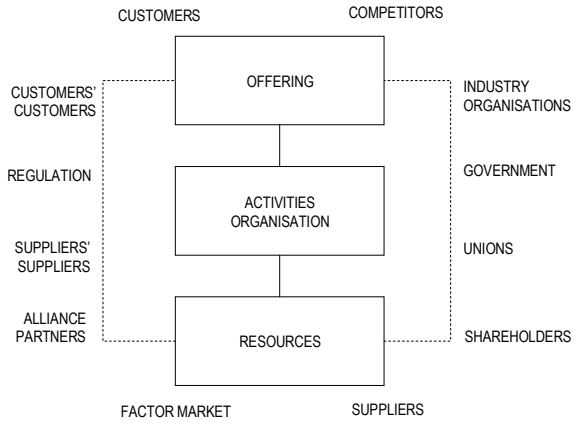


Figure 8: Corporate stakeholders (Hedman & Kalling 2002)

These stakeholders all belong to the boundary of the firm and its direct business environment. The stakeholders also create various degrees of institutional influence, which supports the firm but also limits its manoeuvrability. The stakeholders contribute to the economic competence of the firm, the ability to identify, expand, and exploit business opportunities. They also contribute to the firm's engagement in the search process to increase its fit with the environment.

Resources and Competences: In a business model, strategic and potentially strategic resources should be identified, as well as their interrelations. Further, a strong link among resources, activities, and the position of the offering in relation to customer expectations and competitor offerings is important. Resources can be tangible or intangible and can take physical, financial, human, and organizational forms. Their value is a measure of the extent to which they assets are specific to the organization; their rareness and replicability, and their links to the other components of the business model. In general the overall rareness and value is determined by customers (value) and competitors (uniqueness).

Factor markets and suppliers: Supplier relations and knowledge about input factors are important. Switching costs increase with time, and relying on input factors as a competitive advantage can be risky as suppliers can increase prices, eroding the advantage of the customer. Accessing capital is a key factor, but with increasing transparency of financial markets and interest from the venture capital sector, most firms have access to funding. Accessing knowledge and hiring new employees is a core priority of every successful company.

The Management Process: The business model evolves over time for any given company, and this is shown as the horizontal dimension in the image above. A comprehensive business model could therefore be seen to include a time dimension. The management process required to change the components of the business model include the bridging of cognitive, cultural, and political obstacles and are issues managers deal with on regular basis. Knowledge and norms may have to be challenged when introducing new elements. Corporate culture is a strong factor, especially if it includes knowledge that has been proven over time.

Changes to the business model can appear in both exogenous and endogenous processes. A likely assumption is that a resource basis takes more time to change than products and activities for the firm. Traditional views of a production value chain are increasingly described in terms of "value network".

The transferability and compatibility of digital content and digitalizable functionalities enable firms or divisions within a firm to combine above described stake holder interests. "Converged business models" could then be launched on the four levels of convergence we consider in this thesis: technology, product, firm, or industry level. We will see examples of such converged business models in the next chapter (offered by Softbank and Vodafone), when firms offer fixed, broadband, mobile telecom (and even TV) services in combined packages to customers.

Innovation at the boundary of firms

Let us consider business models in relation to the boundaries between firms in value chains part of networks, and multisided platform markets. First we can differentiate between innovation seen as a product of in-house activity and that seen as a feature of interaction. In those industries with the greatest dependence on research and development such as pharmaceuticals and electronics, sources of innovation have moved from almost self-contained and usually secretive R&D activities to more inter-connected activities sensitive to a wider range of influences.

Baldwin & Woodard (2009) describe how the platforms spanning several firms raise numerous and wide-ranging strategic concerns for firms. At first glance, there are differences between technical platforms (OS, video games, service delivery platforms) and multisided commercial

platforms (credit cards, dating sites etc), but the overall goal of both types is to induce coordination between two or more agents through a component or system. Various tensions invariably exist between platform owners and its users. For internal platforms the threat of a third party entry or customer ownership, and for external platforms it is disintermediation respectively (competitors copying or cloning the platform). In order to describe platforms, visual representation is helpful, and layer maps are one such tool. Layer maps can easily show changes in industry architecture over time and model "co-opetition", the simultaneous existence of competition and complementors in an industry. All models and simplifications sacrifice some of the intricacies and exceptions of the interfaces between technologies and organisations, but layer maps are nevertheless a useful tool.

Christensen & Raynor (2002) describe how designing and delivering products based on interdependent interfaces is demanding, especially when a firm is horizontally focused (non-integrated), trying to stitch together a system with partner companies. When subsystems and expertise that partner companies provide are closer to the interdependent architecture, this kind of partnership is most probably designed to fail. Companies that are integrated across modular interfaces suffer from inefficiencies that seem inevitably to stem from the heavy hand of bureaucratic control. Companies that use market mechanisms to transact across an interdependent interface suffer from the deals engendered by an inability to specify, verify, and predict precisely what they want from suppliers. Every time something comes back "wrong" from a vendor, the legal requirements of ascribing blame and allocating costs in a negotiated environment make it difficult to "get on with it". Christensen & Raynor (2002) argue that one approach will enjoy structural advantage, not that alternative approaches won't be successful. Further, they claim, value chains move between modular (disruptive technologies driven by complexity) and interdependent interfaces (innovation and convergence).

Ford et al. (2006) claim new technologies affect coordination in their potential for disintermediation (create direct linking of actors) and re-intermediation (create new nodes of interaction actors). The general value provided through improved coordination can be broken down into elements of: matching, aggregation, integration, and creativity. For a firm to successfully innovate and be competitive in a networked market, its ability to adapt to the

changing environment and absorb diffusing information is crucial. Cohen & Levinthal (1990) argue in their famous article on absorptive capacity that

> "…outside sources of knowledge are often critical to the innovation process, whatever the organisational level at which the innovating unit is defined… prior related knowledge confers an ability to recognise the value of new information, assimilate it, and apply it to commercial ends. These abilities collectively constitute what we call a firm's *'absorptive capacity'*".

In the following some strategies for exploiting external sources of innovation is reviewed (Tidd et al. 1997). Firms collaborate for a number of reasons according to them:

- to reduce the cost of technological development or market entry;
- to reduce the risk of development or market entry;
- to achieve scale economies in production;
- to reduce the time taken to develop and commercialise new products

Two factors need to be taken into account when deciding to "make or buy" a technology: the transaction costs, and strategic implications. Projects involving technological innovation features uncertainties associated with completion, performance, or pre-emption by rivals. A seller of technological or market know-how may also engage in opportunistic behaviour (high price, poor performance). Therefore transaction costs increase when a purchaser has limited knowledge of the technology. But generally the strategic implications are more significant than transaction costs when deciding to acquire external technology (according to the UMIST survey, Tidd et al., 1997, pp 201). Research on the accumulation of competence and absorptive capacity support the idea that acquisition of external technology should be used to compliment internal R&D rather than just being a substitute. Tidd et al. also identify a number of risks associated with collaboration: leakage of information, loss of control or ownership, divergent aims and objectives, resulting in a conflict. In order to innovate effectively with other firms (innovation at the boundary) these risks are dealt with in various forms of collaboration according to duration:

Type of collaboration	Typical duration	Advantages (rationale)	Disadvantages (transaction costs)
Subcontract	Short tem	Cost and risk reduction, Reduced lead time	Search costs, Product performance & quality
Cross-licensing	Fixed term	Technology Acquisition	Contract cost and constraints
Consortia	Medium term	Expertise, standards, share funding	Knowledge leakage, subsequent differentiation
Strategic alliance	Flexible	Low commitment, market access	Potential lock-in, knowledge leakage
Joint venture	Long term	Complementary know-how, dedicated management	Strategic drift, cultural mismatch
Network	Long term	Dynamic, learning potential	Static inefficiencies

Table 3: Types of collaboration between firms (Tidd et al., 1997)

They identify two dimensions which affect companies' attitudes towards technology acquisition: the characteristics of the technology and the organisation's "inheritance". The relevant characteristics of the technology include:

- Competitive significance of the technology
- Complexity of the technology
- Codifiability, or how easily the technology is encoded
- Credibility potential, or political profile of the technology

Codifiability can be compared to Christensen et al.'s notion of "structured dialogue", a condition for *markets* to be the most efficient coordination mechanism between firms.

Although acquisition of knowledgeable companies seems to be an attractive option for companies that have to deal with convergent technologies, acquisition strategies are hampered by at least three main problems (Aldrich & Auster 1986).

- The first problem is associated with information distortion and opportunism, which may mislead the acquiring firm
- A second problem is that creative and innovative companies which are later incorporated in a large and bureaucratic structure often lose their flexibility and therefore lose much of their or original creativity and innovativeness
- The third problem is related to the externalities which are connected to the acquisition of a company. It is often difficult to divest those assets which were not sought for in the first place.

If a company does not have an already sufficiently developed level of technological knowledge in a specific field, it turns out to be extremely difficult to absorb the acquired knowledge into its own technological core (Cohen & Levinthal 1990).

Platforms as exchange regimes

As discussed in previous section, innovation at the boundary among networks of firms enables platforms to connect the supply and demand of new services. When platform owners facilitate service delivery a trade takes place within either a supply chain and/or a multisided market.

Exchanges of services for a monetary fee, time (advertisements), or other types of payments would be governed by an agreement and/or contract between a buyer and seller, or with the platform itself. As explained by Shapiro & Varian (1999), digital services are an experience good and often consumed by the user immediately or within a limited time. Therefore the content quality cannot fully be described in the contract due to this interpretive aspect of the service. As Bowles (2004) describes it "…many of the services or goods involved in the exchange process are inherently difficult to measure or to describe precisely enough to be written into a contract". Emile Durkheim observed that "Not everything in the contract is contractual… the contract is not sufficient in itself but is possible only thanks to a regulation of the contact, which is social in origin" (Durkheim 1967). In short one could quote Hobbes who already in 1651 wrote "where there is no trust, there can be no contract" (Hobbes 1651). A contrast to such incomplete contracts is exchanges of homogenous commodities (such as oil or specific grades of agricultural products). Complete contracts are possible in such situations, as a precise specification of the trade could be described in weight, volume, grade, and delivery terms. With this taxonomy it is

apparent that almost all contracts governing the delivery of a service would to a large degree be incomplete, as quality is in the eye of the beholder.

A mobile service would often consist of at least two components: the intellectual property object, and the actual delivery of it. The intellectual property object (e.g. music song, video game, TV programme, or event ticket) could often be specified to the details, but the delivery during the exchange of such objects (or digital content) and the actual experience of consuming the content itself would often be impossible to regulate in a contract.

Brown et al. (2004) conclude from market experiments that very different patterns of trading emerge under complete and incomplete contracting conditions. In brief, incomplete contracting induced a more intensive contact between buyer and seller focusing on quality, whereas complete contracts induced a higher degree of one-shot deals. The experiments suggest that there is a relation between trust and reciprocity on one hand, and the type of contact on the other. They summarise their findings in the following:

Structure of interactions	**Complete contracts**	**Incomplete contracts**
Duration	One shot	Contingent renewal
Offers	Public	Private
Price determination	Haggling, offers rejected	Price setting by short sider
Traders' relationships	Anonymous	Trust, retaliation for cheating
Market networks	Many weak links	Bilateral trading islands

Table 4: Complete and incomplete contracts; Brown et al. (2004) and Bowles (2004)

When a pair of organizations and/or individuals can engage in mutually beneficial trade but have conflicting interests over the terms of trade a *bargaining situation* occurs. It is possible that the players will reach an agreement only after some costly delay, or indeed fail to reach any agreement. A main focus of any theory of bargaining is on the *efficiency* and *distribution* properties of the outcome of bargaining (Muthoo 2000). If it did not matter *when* the parties agree, then it would not matter *whether* they agreed at all. Factors affecting friction in a bargaining process are *impatience* and *risk aversion*.

Impatience stems from how the parties value *time* in reaching an agreement. Each player prefers to reach an agreement on any particular price today rather than tomorrow. A player's bargaining power is greater the more patient she is relative to the other party. Patience during the process of negotiations strengthens bargaining power, while risk aversion affects it adversely. A player's outside option enhances her bargaining power if and only if it is attractive and therefore credible. If negotiators have attractive external options (buying or selling the service or product somewhere else) gains from cooperation may not exist (and the parties may thus prefer to exercise their respective outside options). Knowledge of alternative market prices gives power in negotiations and enhances the bargaining strength of the better informed.

An aspect affecting bargaining power is so-called "multi-homing". Multi-homing (users having access to more than one platform) may or may not be the case among buyers on the platform. The availability of outside options in the bargaining process would therefore be limited by lock-in effects (a limited number of services are available for their particular handset) or acts by monopolistic actors (services that are only available on certain carrier networks). Such lock-in effects and monopolistic behaviour would in most markets be monitored by a regulator.

The type of contract used and the characteristics of each bargaining scenario, would also affect the elasticity and market power on the buy and sell-side respectively. Hence the characteristics of potential multisided markets being created by the platform.

In a traditional ad-based environment Bria et al. (2007) visualise a sliding relationship between payments in cash (fees) and time (advertisements):

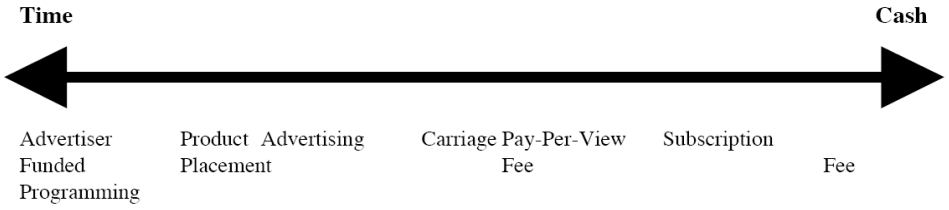


Figure 9: How viewers pay for content (Bria et al. 2007)

Following from the reasoning in previous section, an impatient actor could be willing to pay for content rather than exposing himself to interruptions in the service (TV programme e.g.).

Discriminatory pricing (subsidies) between the supply and demand sides of the platform therefore becomes an important part of the architecture of the revenue, i.e. what is referred to as the "business model" in this thesis. As "eyeballs" (advertisements exposure) is traded for money (Internet search and TV advertisements), or access to a "walled garden" for application providers (console gaming, dedicated mobile phone applications), the platform facilitates exchange, not only delivering the service. When also the social interactions of contracting and bargaining related to the platform are taken into account, we can view the role of the platform as an exchange regime, and to some extent regulating a multi-sided market, as pointed out by Boudreau & Hagiu (2009). Such an exchange regime governs the choices for actors being ruled by the platform and therefore the business models available to them.

Products or platforms in which there is little or no value to the first users due to the existence of strong direct (for example, telephone) or indirect (complementary products) network effects face a significant start-up problem (Economides 1996). According to Funk (2004) the Japanese and to a lesser extent Korean service providers early on solved the start-up problem of direct network effects with entertainment content supported by an micro-payment system and by custom phones that enabled content to be displayed in a consistent manner. It could be likened with an exchange (micro payment system) and standardization (custom phones) that enabled a higher degree of complete contracts to be entered.

Methodological approach

One of the challenges in studying innovation is its interdisciplinary nature: Economics and management often belong to two different schools of thought and focus on macro and the micro perspective respectively. Attempts to bridge this gap were pioneered by Schumpeter, whose main points rest on notions of the availability and use of debt financing by risk takers to introduce new techniques, structures or procedures. However, Schumpeter left technology as an exogenous variable without studying the dynamics of technology innovation itself.

Management studies often focus on micro level resource allocation, leadership and capabilities. Such studies lend themselves to a meso-level network unit of analysis, but rarely to suitable models of industry convergence. Scholars of interdisciplinary studies of science, technology and society's role in its design, loosely formed what was called science and technology studies (STS) from the 1960s onwards.

The author's own home university in Sweden was established in 1969, and started a pioneering programme, an "MSc in Industrial Engineering and Management", combining engineering and social science studies. The degree came under much critique for neither training 'proper' engineers nor students of business. Such were the times. During the 1980s STS saw two influential books: *The Social Shaping of Technology* (MacKenzie & Wajcman 1985) and *The Social Construction of Technological System* (Bijker et al. 1987). These two books set the scene for social constructivist studies of innovation, which tradition the methodology of this thesis follows.

Below an overview is given on methods, methodology, theoretical perspective, and notes on epistemology for the thesis, inspired by Crotty (1998):

Theoretical considerations:	Crotty's suggestions for what is needed for an answer (2003):	The objective of the thesis:
What methods do we propose to use?	The techniques or procedures used to gather and analyse data related to some research question or hypothesis.	Three cases of and a review of recent history specific to the smart phone industry.
What methodology governs our choice and use of methods?	The strategy, plan of action, process or design lying behind the choice and use of particular methods and linking the choice and use methods to the desired outcomes.	The cases consist of interviews of entrepreneurs, regulators, and established firms. Archival sources from corporate homepages, newspapers, industry journals, and industry analysts.
What theoretical perspective lies behind the methodology in question?	The philosophical stance informing the methodology and thus providing a context for the process and grounding its logic and criteria.	A constructivist view that business reality is interpreted by firms suffering from "bounded visions". Service innovation is a systemic phenomenon that could be observed by studying networks of influential firms within a national context.
What epistemology informs this theoretical perspective?	The theory of knowledge embedded in the theoretical perspective and thereby in the methodology.	Interview and archival research is sufficient as evidence to describe and answer the research questions.

Table 5: Theoretical considerations in the thesis (inspired by (Crotty 1998)

The research method

The research method needs to account for the notion of a "seamless web" (a heteregenous network) that could be seen to develop between organisations and technology (Bijker et al. 1987). As mentioned, existing evidence in the form of statistics from community innovation surveys (CIS) are patchy at best. An option would be to either pursue such a survey collection ourselves in order to fill this obvious gap, to pursue a case study, or a history. All these options would be combined with archival research, as much of contemporary events are covered in newspapers, reports, and presentations. In order to describe industry dynamics over time, a

single survey could be enlightening, but not sufficient to answer our research questions. The choice of research method falls on a history study incorporating multiple cases enabling key indicators to be studied both in depth and over time.

The choices of three cases focus on services both in the UK and Japan (portal services supported by micro billing, mobile TV, and mobile event ticketing). The cases are chosen in order not only to explain each service, but also to use the collective findings from the three cases in order to get an appreciation of how the mobile Internet and service innovations developed over time. Documentation involves publicly available information from web pages, newspapers and journals, as well as restricted consultant reports and seminars. The methodology for studying innovation must fit its generally complex character and focus area, such as making distinctions between invention and innovations. The former describes the occurrence of an idea, while the latter is the first attempt to carry it out in practice (Fagerberg 2005).

Often there is a considerable time lag between the two, reflecting the different requirements for working out ideas and implementing them. Invention and innovation is a continuous process, and the first versions of virtually all significant innovations, were crude and unreliable versions of the devices that eventually diffused widely. As Kline & Rosenberg (1986) point out:

> "…it is a serious mistake to treat an innovation as if it were a well-defined, homogenous thing that could be identified as entering the economy at a precise date – or becoming available at a precise point in time… The fact is that most important innovations go through drastic changes in their life-times – changes that [can?], and often do, totally transform their economic significance. The subsequent improvements in an invention after its first [specification?] may be vastly more important, economically, than the initial availability of the invention in its original form"

Bruland & Mowery (2005) discuss the importance of studying innovation over time:

> "most analysts of innovation emphasize the importance of a historical approach…first, innovation is time consuming, based on conjectures of the future, and its outcomes typically are uncertain for long periods… second, innovative capabilities are developed

through complex, cumulative processes of learning. Finally, innovation processes are shaped by social contexts."

To capture the systemic nature of innovation, macro level perspectives from industry-wide studies and micro scale studies on the managerial level complement each other (Misa 1994). The macro level (which we take here to be the industry level) perspective is affected by major actors and formations in the international standards bodies (including carriers, vendors, national agencies and regulators). On the micro level, innovation management and partnership strategies create dyadic relations and networks between companies, managed by corporate leaders with varying agendas depending on the social setting and culture in which they act. The dynamic features of innovation studies in such combined macro/micro studies can be seen in conflict with neo-classic economic theory, which fails to provide tools for connecting technology and economics when technology is under change. Neo-classic theory requires future prices, costs, and competitive scenarios to be known in full, which is not the case in a fast-moving industry, where uncertainty is a given (MacKenzie & Wajcman 1985).

Mobile telephony is an industry with a history of agreeing on industry-wide standards. However, the mobile payment systems, especially micro payments for content, have remained more or less proprietary, unique to each carrier. Mobile service delivery and its evolution is a good example of the difficulty in categorising innovation, as its systemic nature makes it hard to draw boundaries between the technical and the social. Categorising innovations enabling mobile phone payments and subsequent "mobile content business", lead us to a discussion of the disruptive nature of information technology innovations, and more specifically, distributed computing capability enabled by the Internet. Lyytinen & Rose (2003) define disruptive IT innovation as an architectural innovation originating in what they call the "information technology base", in our case the shift from circuit switched into packet based data transmission. Our research methodology and unit of analysis must be chosen carefully in order to take into account these intrinsic characteristics of innovation.

Research methodology

As explained in the literature review, the measuring of innovation is a contested and imprecise science. The only consensus among researchers is that no cook book recipes exist. However, organizations and governments still invest great efforts in presenting indices that could be measured and compared over time, linked to economic growth, effects for the educational sector, the usage of ICT, and so on. Quantitative measures are easy to compare and visualize as the end result of innovation, but its power to explain the complex phenomena driving change is very limited. It is in the very nature of innovation that it creates ontological problems, even spurring confusion when we try to describe what innovation really "is".

This thesis follows the approach of estimating innovation processes over time by the defining of, and focusing on, an innovation system, inspired by Hughes' (1987) notion of a large technological system. For the purpose of describing the innovation (or technology) system of smart phone services we will apply Hughes' way of presenting the history of evolving, or expanding, systems in *phases* (in which the activity named predominates): invention, development, innovation, transfer, and growth/competition/consolidation (service innovation doesn't necessarily happen in that order though). Hughes also refers to technological *style*, as style occurs when discussing architecture or the arts. It refers to the fact that e.g. electric light and power systems differ in characteristics from time to time, from region to region, and even from nation to nation. The usage of load factor and reverse salients are also part of the systems view of innovation. Hughes also comments on the challenge of studying innovation with a technological systems approach, which we shall keep in mind:

> "In a large technological system there are countless opportunities for isolating subsystems and calling them systems for purposes of comprehensibility and analysis. In so doing, however, one rends the fabric of reality and may offer only a partial, or even distorted, analysis of system behaviour"

The innovation system in our model contains various exchanges, where payments in the forms of user fees and advertisements take place. In return individuals or companies get a particular service delivered. One or more actors operating a service delivery platform enable the exchange. A Coasian neutral price through direct bargaining (Coase 1937) between the two agents is not

possible, since the exchange is facilitated by the platform owner. Since there is no pricing neutrality, platform strategies could be based on price allocation between the two markets, rather than conventional cost-based pricing. In this way converging markets could be modelled in those cases where such exchanges and service delivery platforms exist. To model such platform economics and related business models it seems promising to include the concept of two-sided markets.

The concept of two-sided markets is a relatively new concept (Bourreau & Sonnac 2006) whereby one or several platforms facilitate interactions between users on two different sides of a market. It provides an alternative way of analysing converging markets and thereby industry dynamics by taking technical innovation into account through its recognition of the economics of platforms. Further, the two-sided market model provides different conditions for pricing compared to one-sided markets, which are an important aspect of business models available to platform providers.

Turning to the evidence, the archival research focus first on background material (on regulation, services, and telecom innovation) through reports from corporations, governments, consultancies and other written sources. The second focus lies on case material collected from corporate homepages, newspapers, and industry journals. Interview questions were developed and carried out in actual interviews mainly throughout 2007-2009 and focused on how new services are being developed; the firm's current and previous participation or enabling of respective services; the effect of regulation, standards and best practices; and how cross-industry networks contribute to innovation and competition for new services.

Sociologists of technology have argued that technology failures are as important as success stories and suggest that controversy is an important site for research. A common debate is whether information system failures are software or management failures when it could be argued that there is no technical failure without a social component and the other way around (Mitev 2005). This thesis will therefore include elements of failure alongside success in order to contrast and connect the evolution of technological systems.

Theoretical perspective:

Carlile & Christensen (2005) outline a process for descriptive theory building:

1) observation (develop *constructs*),
2) categorisation into *frameworks* (classify the phenomena into categories, relation between phenomena and outcomes of interest),
3) association difference in attributes and correlations between these attributes and outcomes (output of studies in stage are *models*)

As we have observed and reviewed the literature we attempt to categorize our conceptual constructs into a framework that we will return to after developing the overarching research question with the help of concepts presented in the literature review.

Actor-network theory has gained popularity within information systems research and being developed mainly by Michel Callon (1986) and Bruno Latour (1999; Latour & Woolgar 1979) with contributions from a wide range of other scholars. Although termed "theory", it is better described as mapping semiotic relations between (human and non-human) actors in order to understand how realities occur during interaction. Not only people, but also physical artifacts, non-humans, and organizations count as actors. A wealth of studies in the information systems relevant to this thesis use ANT for example Allen's notion of technological frames in the PDA industry (Allen 2004), and Tilson's study of mobile TV in the UK and US (Tilson 2008).

Case studies using ANT are often descriptive and focusing on the "micro-level". This thesis will instead apply Hughes' systems and a social constructivist view. Thereby we continue to make a distinction between human actors and the technology shaped or constructed by humans when developing our constructs, frameworks, and models.

Epistemology

To create meaning for what innovation is, and how we come to learn about it, the epistemological approach affects our investigation. Reality as a social construct was introduced by Berger & Luckmann (1967). Hacking (1999) finds important aspects of constructionism as external explanations of stability, and that processes are not inevitable by showing how they

came to be in historical setting and explanation. Mitev (2005) describes how the larger discipline of science and technology studies (STS) can be divided into three main approaches: mild constructivism (social shaping), constructivism (social construction of technology), and strong constructivism (actor-network theory – ANT). This thesis considers interview and archival research efforts sufficient as evidence to describe and answer the research questions. It includes observing practices, charting change, learning from the observations of others, eliciting the views of participants, and considering laws and norms. Together they give evidence about the form, dynamics, and trajectories of the businesses and their relationships with the technologies. People with different educational and professional backgrounds will refer to their experiences in different ways due to different epistemological contexts. We will return to this topic in the planning of case studies and interviews. Bijker & Pinch (1987) divide technology studies into innovation studies, history of technology, and sociology of technology. Embracing my engineering background I agree with the authors when they claim that in order to apply a social constructivist view on innovation, one must open the "black box" of technological content in order to understand how technology and development is created. When not opening that black box it seems challenging to extract empirically useful evidence about it in my view. By recognizing individual base technologies making up platforms or technology systems we will also be able to analyse the importance of key technologies and how they emerged through innovative activities over time. In the thesis I will attempt to strike a balance between technological determinism, often associated with an "engineer's view" - inspired by Kuhn's technological paradigms, (Kuhn 1962) on one hand and a social interpretive view (often associated with a "business person's view") of innovation on the other. In academic tradition this middle way corresponds to different flavours of social constructivism.

Research Plan

Tactics and hypotheses

The research plan is the tool whereby the research questions can be dealt with in the thesis. Our research is influenced by observations from interviews and archival research. Carlile & Christensen (2005) view of theory building fits our efforts in the thesis of developing and testing a model of how innovation occurs. Therefore the cyclical sequence of observation, categorization, and association (inductive research) is used to describe the basic research plan for the thesis:

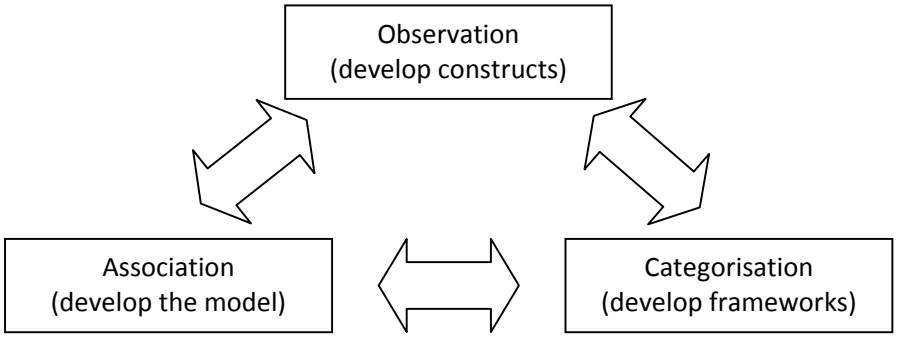


Figure 10: Theory building according to (Carlile & Christensen 2005)

Designing and refining the model is an inductive element of our study. After having conducted the case study and tested the model deductive elements are carried out: comparisons between the cases for testing its reliability and secondly test our model on other aspects of convergence in the telecom sector in the synthesis chapter.

As we have outlined in the preliminary theoretical framework above, the two-sided market concept deals with the economic effects of platforms, such as transforming advertisements viewers to revenues (fees). However, for the purpose of researching service delivery as a driver for industry dynamics, it is also necessary for us to consider the technical components of the platform itself. We analyse the interaction among providers of these components in terms of the cost of collaborating with platform technologies as they affect decisions on in-house production or outsourcing. When certain key technologies in an industry are commoditized, transaction costs to integrating them into the mainstream business decreases, leading potentially to vertical integration in an industry. For the purposes of this analysis we assume the following:

1. Internet service markets could be described as multi-sided markets (of service providers and users), connected by platforms
2. The technical capabilities of the platform affect how users and sellers interact with the platform and therefore the demand elasticity of the two sides of the market
3. Platforms are operated by one or more technology providers, supplying a chain (or network) of delivery technologies, where decisions of collaboration or vertical integration among respective provider is much affected by the level of “structured dialogue” (Christensen et al. 2002).

We further assume that platforms mediate various levels of convergence developed from von Tunzelmann & Fai (2001):

- Industry level: Technical interfaces between fixed and mobile service delivery platforms; industry interfaces between the media, IT, and telecoms industries.
- Product level: Boundaries between product markets (e.g. market of mobile music downloads and digital event tickets
- Firm level: Organisational boundaries in the delivery chain
- Technology level: Interfaces between mobile delivery components

These assumptions provide a cascading model for how individual technologies within the service platform affect the capability of the whole platform, then how platform capabilities affect the demand elasticity of the market, and thereby pricing strategies and business models. We could therefore use our model as a framework to study how firm collaboration and technology innovation *within* the platform affects pricing and profits in particular two-sided markets.

As a pre-study (presented at Helsinki Mobility Roundtable, June 2006) a comparative case study of mobile data service delivery (for mobile phones) in Japan and the EU (2000-2005) was carried out[5]. From the pilot study at the Mobile World Congress (February, 2007) several of the respondents in telecom operators and content providers believed advertising on mobile channels would increase, following the pattern of Google and other companies targeting users surfing the Internet on PC browsers. We therefore hypothesized from the outset that users could be seen as paying for services in two ways: fees (money) and time (advertising).

There are a number of reasons to pick cases from Japan and the UK apart from the fact that they are readily accessible by the author. Both Japan and the UK are among the top IT spenders in the world, they have a history of pioneering new developments in the telecoms industry, and are home to some of the world's largest telecom operators. Japan had about 50% higher total IT

[5] During 2002-2004 the author also represented his Japanese employer in WAP Forum and 2004-2006 was closely engaged with development of software for mobile phones and service delivery platforms in both Japan and Europe.

spend (US$143.8bn) than the UK in 2010, but more than four times as high mobile telecoms spend[6]. Japan has seen NTT DoCoMo create the world's first successful mobile Internet portal. The UK has seen Vodafone spread around the globe, even becoming the third biggest operator in Japan through its acquisition of J-Phone in 2002 (and divested again in 2006). When comparing how firms have developed services in the two markets it is important to remember institutional differences. We will focus our study on business networks and technology, in an attempt at diminishing abstract notions of "culture".

Rationale for case studies:

In the selection process of actors to study key industry actors are carriers, handset makers, infrastructure makers, content providers, retail brand makers, enablers, and users. However, from a content delivery point of view, networks are owned and managed by the carriers, and the handsets are more or less the same to all carriers as in the EU or procured and developed jointly with the carriers, as in Japan. In the perspective of content delivery, handsets and networks are included in the business strategy of the carrier. We therefore choose to focus our analysis on four actors: carriers, content providers (also called content aggregators), enablers (called service delivery platform providers), and retail brands. Handsets and infrastructure features were until the launch of smartphones in 2007-2008 exogenous factors for all actors but the carriers, so we inscribe it in the carrier business strategy. Users, their preferences, and other demand factors are assumed to be taken into account by the business strategies of all four actors, so we will not focus on users as such.

Case selection:

When observing exchange regimes both indirect (advertising) and direct (fees) techno-social systems of mobile payments and revenues will be researched taking our conceptual review of business models. Contents in indirect billing systems are generally not charged to the end-user, but paid by advertisers or other information providers. Offers combining indirect and direct payment systems are common. An example would be a mobile site where advertisers (who do not charge the end-user) and content providers (who charge for content downloads via micro billing) display their offerings side by side. Another more intricate example is a mobile portal,

[6] A further comparison back in time will have to take (substantial) currency fluctuations into account

provided by a carrier that includes search engine functionality, where users search for content (e.g. a specific game software). Behind the scene content providers might bid for popular key words (such as game, girl, gambling etc) in weekly auctions (arranged by the search engine provider) in order to be on top of the resulting list that the end-user sees upon his key word search.

Mobile payments are important enablers for the mobile commerce offerings (payment for digital content, physical goods, and services) of service providers. As such, mobile payments is suitable as a study area for how information systems innovation emerge, diffuse and interact with other actors in a value network, contained in a socio-technical innovation system within an institutional framework (represented mainly by regulation and standardisation). By studying both technical components of platforms, positioning of firms, and mobile payments we hope to gradually be able to identify value network dynamic. The offerings among service providers to end-users are created as a dynamic process within business models that we hope to identify. The value of mobile payments therefore diffuses "down" to end-users via the business models, and ultimately the offering, of service providers.

Standardisation affects the economics of mobile payment networks and takes place under supervision of national policy makers and international industry organisations. The institutional influence of regulation and standards cannot be neglected, as telecommunications is a much regulated industry (Economides 2004). In this research, national regulation is simplified into being part of carrier strategy on the firm-level. Other actors (service providers, retail brands, service delivery platform providers) are influenced by national regulation mainly through the carriers. Significant differences between Japan and the UK are observed in terms of national regulation and carrier behaviour. In terms of international standards the research model assumes the following: Japanese actors are mainly affected by carrier behaviour, but in the UK influence of standards disseminate to service providers through both carriers and handset makers. This will be investigated in the cases.

A pre-study (Kärrberg & Liebenau 2006) was presented at Helsinki Mobility Roundtable 2006. It is a comparative case study of mobile data service delivery (for mobile phones) in Japan and the EU

(2000-2005). It introduces various service innovations since the inception of the mobile Internet and assists in defining research assumptions for the methodological approach.

Case method:

A multiple case study has been carried out in order to find enough evidence for the relatively demanding time period and country comparison under study. Time available in Japan during the two field trips has also been a limiting factor. In order to limit the cases telecom operators have been seen as central actors since the launch of the mobile Internet was centred around their efforts, especially in Japan. Companies interviewed and studied in Japan and the UK have also as much as possible been matched across actors (Eisenhardt 1989, p533). The case study is planned to simultaneously explain patterns of both macro and micro aspects in relation to the thesis: industry convergence and interaction between actors on one hand, and innovation management practices and dyadic network management on the other. Samples from Japan and the UK will be used, and these will be related to the method design approach focusing on delivery platforms, that could be seen as information systems artefacts (Benbasat et al. 1987). Participants will express both technical facts and interpretations of complex events. Bounded visions among organizations and individuals means that some views on the same phenomenon might be conflicting and need to be confirmed or referred to as "different interpretations". Interviews have been carried out over telephone or face-to-face.

Case interviews

Interviews in this category are the ones directly related to the case services. Several interviews with companies involved in the planning, development, and offering of services related to its delivery will be carried out.

Case-related interviews

This category consists of companies and organisations that have a link or relation to our case companies. Interviews with these companies give further information related to our research question. The aim is to interview people responsible for activities involving with case companies.

Background interviews

These interviews supply information about history and trends within the mobile Internet industry. Background interviews can also be aimed at getting a middle-hand in establishing contact with interesting companies. Another type of background interview deal with academic institutions,

governmental bodies or organisations with general knowledge of the concepts deployed in our method.

The interviews have followed a semi-structured format, which is most common in case studies (Yin 2002). Open-ended questions are asked and the author will group data into themes and categories forming the key findings. Further analysis arrives at generalisations that can be compared with the literature review and arrive at conjecture (Saunders 2003).

The cases have been taken from mobile service providers relevant to each theme in the cases, and carriers. Background interviews with other relevant organisations, such as regulators have been undertaken in order to further triangulate what actors are central to certain events or processes central to our analysis. A complete list of interviews is provided in an appendix. Interviews with firms with their primary location outside Japan and UK have also been conducted in cases when their activities are deemed as highly relevant.

Before an interview the interviewee is also informed of how the data will be used:

- on the record (everything accessible including quoting person, and recorded);
- unattributable (recorded, but I won't give out exact source);
- Background/Off the record (no recording, not allowed to quote).

The author has gone to length to keep agreements with interviewees (59 interviews in total) regarding how to publish material that is confidential or may include trade secrets.

Case study phases:

The initial study of service delivery was carried out during six months at the end of 2005 until March 2006 and published in a conference paper at the Helsinki Mobile Roundtable (Kärrberg & Liebenau 2006). While working in Tokyo, then the Netherlands and the UK, the author was interpreting different mobile services, its delivery and business models. The focus of this pre-study was on convergence between systems and devices used in the IT and telecom industry respectively. After passing the MPhil programme the author conducted a pre-study where concepts and assumptions were tested by interviewing Japanese and UK companies at the World Telecom Conference in Barcelona 2007. Field research in the UK was then combined with two

field trips to Japan in May 2007 and October 2007 (including the CEATEC exhibition). Further interviews were carried out again in Barcelona at the World Telecom conference in 2008. At the LSE, the author organized three MBA style courses with UK regulators and telecom executives as guest speakers. This was carried out targeting Asian executive MBA students during the summers of 2007-2009 in London. Further, the author assisted a London start-up in the mobile event ticketing space and travelled with these British entrepreneurs to Tokyo for the Consumer Electronics and Technology Exhibition 2007 (CEATEC). Concepts and case material was also published at various PhD seminars and research conferences during 2006 to 2010 (Bria et al. 2007; Kärrberg & Liebenau 2007; Kärrberg 2008; Kärrberg 2010).

Data Collection and Interpretation Methods

Data Collection and demarcations

A study can be classified according to what it is aiming at. Lekvall & Wahlbin (1993) identifies four different types of studies: exploratory, descriptive, explanatory and predictive. I intend to carry out a descriptive history study and an explorative case study as part the thesis.

An *exploratory* study aims at providing basic knowledge and understanding of a problem area. The initial study of mobile service delivery companies belong to this category. This type of study was pursued as survey and case study over several years and was used in order to better specify the mission of the main research question. The overview of national institutions will to some extent only be *descriptive* (via archival study) as it's outside the scope of this thesis to provide the full history and internal structure that explains certain features.

A multiple case study is carried out covering both Japan and the UK. In the empirical investigation it is important to recognise the two streams of literature covered in innovation studies: the disruptive stream focusing on the importance of a few critical innovations, and the technology systems view, stressing the co-evolution of techno-social systems including institutional and internal organisational processes.

By applying an industry macro view and a corporate micro view, a balance is struck between these two perspectives. A historical study needs to start at least by the mid-1990s before the launch of the first mobile telephone Internet applications, and by the time of SMS taking off.

Written sources consist of:

1. Annual reports on public companies. Checking over a period of years, covering trajectories of strategic change or real change: purchasing of new facilities, new alliances, open lobbying towards national policy
2. Reports about industry change from consultancy firms, newspapers etc.

The archival research has been complemented with over 25 interviews each for Japan and the UK. The interviews are prime opportunities to find out about people's opinions about chosen strategies, to see where they emphasize(d) their actions, what they see as important in the public information, what levels of commitment they have to certain kinds of behaviour. An example being if a strategic alliance is managed by the CEO or a regional director respectively. If managed by the director it could mean the relation is important but routine to manage, but it may also mean it is not important and considered peripheral to the core business. Such differentiated views on strategic alliances (or similar situations regarding product developments) can only be probed by interviews, if not available in written sources.

Unit of analysis*:*
Service delivery platforms in the smartphone service sector. The analysis is limited to actors and institutions related to mobile services in Japan and the UK. The main entities to be studied are telecom operators, mobile content providers, service delivery platform providers, and retail brands.

Data Sources and Data Interpretation

By applying triangulation of different methods for data collection sources of error and a higher reliability of conclusions can be achieved. Archival and case studies are planned to verify background information.

Sources of Error and Validity

A study can contain sources of error from the purpose formulation to the presentation of the results. Frame errors occur when the target population and the registered population does not match. Because of the convergence of technologies and actors involved, clear definitions and

delimitations of the study has to be set in order to avoid frame errors. Another potential error lies in language barriers, as I am not a native speaker of neither English nor Japanese. English questions will be translated into Japanese when sending them to some of the Japanese companies.

Validity deals with the problem whether the used method really measures what it is intended to measure. This will be further developed parallel with phrasing interview questions. As mentioned, a theory's *internal* validity is the extent to which: 1) its conclusions are unambiguously drawn from its premises; and 2) the researchers have ruled out all plausible alternative explanations that might link the phenomena with the outcomes of interest (Yin 2002). Carlile & Christensen (2005) claim it is impossible to establish the external validity of a theory by testing it on data. The *external* validity of a theory is the extent to which a relationship that was observed between phenomena and outcomes in one context can be trusted to apply in different contexts as well.
Carlile & Christensen (2005) further claim that a normative theory is externally valid when the categories of circumstance are mutually exclusive and collectively exhaustive. Mutually exclusive categorization would allow managers to say, 'I am in this circumstance and not any of those others.' Collectively exhaustive categorization would assure that all situations that managers might find themselves in with respect to the phenomena and outcomes of interest are accounted for in the theory. Carlile & Christensen (2005) also claim that no theory's categorization scheme is likely to achieve permanent status of mutually exclusive and collectively exhaustive. However, refinements, they say, come from cycles of anomaly-seeking research that can symptotically improve theory towards that goal. Carlile & Christensen (2005) conclude that methods of measuring statistical significance show that the larger the sample size, the more certain we can be of a model's *internal* validity. However for *external* validity the unit of analysis is a population of companies, so the researcher can be specific only about the entire population of companies.

Yin (2002) provides some tactics for research design tests as summarised below:

Tests	Case study tactic	Phase of research in which tactic occurs
Construct validity	• Use multiple sources of evidence • Establish chain of evidence • Have key informants review draft case study report	Data collection Data collection Composition
Internal validity	• Do pattern-matching • Do explanation-building • Address rival explanations • Use logic models	Data analysis Data analysis Data analysis Data analysis
External validity	• Use theory in single-case studies • Use replication logic in multiple-case studies	Research design Research design
Reliability	• Use case study protocol • Develop case study database	Data collection Data collection

Table 6: Case study tactics (Yin 2002)

Demarcations

Most regulation from the telecom liberalisation in Europe and Japan have focused on network access rather than applications themselves. As our research focus lies on the applications rather than access, regulation of access is not at the heart of this thesis. Hence, most aspects of our investigation are affected by self-regulation of some sorts with a few exceptions that will be analysed when relevant.

Particulars regarding field research in Japan

Doing field research in Japan is somewhat more complicated than the UK for obvious reasons: language and culture. Japanese homepages can be deciphered with translation programs, but contacts via email and phone are preferably done in the local lingo. Due to the author's long experience of working with Japanese companies and living in Japan this provides an advantage.

In general it is more difficult to access information in Japan than in the West. Companies do not give out as detailed statements of account as in the West (very rarely in English), and shareholders are used to sparse corporate information. Furthermore, the Japanese traditionally feel a stronger connection to the working place than in the West. Japanese can go to great lengths in avoiding a direct conflict with other people and organisations with the result that subtle meanings and hints in the language become important in human relations. This is important to remember when interpreting interview material.

One preparation is to associate oneself with a well-known organization in Japan, in my case I utilized former connections with Japanese employers and my institutional connection to London School of Economics. Being seen as neutral or an ally is good when conducting research. When contacting a Japanese organization it can be helpful to use a middle-hand.

Theoretical framework

In this section we apply the concepts from our literature review to develop a construct of service delivery platforms mediating interaction across a technological system. At the end of the chapter our model of service delivery is positioned as the platform component within the two-sided market concept. In this section it is therefore our purpose to further develop and define the key concepts in our methodological construct and arrive at a set of specified research questions around which the analysis in the empirical chapters will focus.

We could consider an overview by OECD listing various types of revenue creation from digital contents:

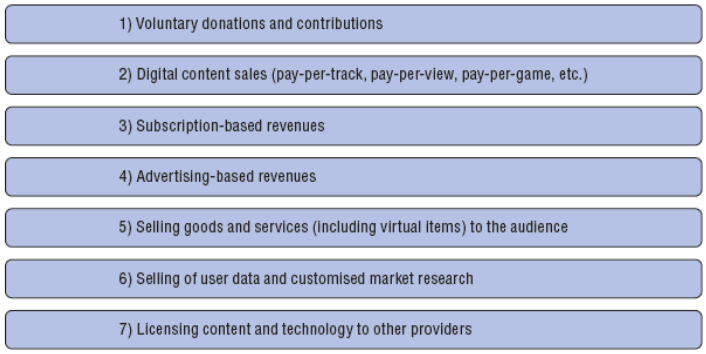


Figure 11: Digital broadband content business models (OECD 2008)

The general services offered on-line are summarised in below table:

User-created content	Mostly free or voluntary donations and contributions. Increasingly subscription- and advertisement-based revenues and business-to-business licensing of technologies. Revenue increasingly generated by selling user information or offering access to the user community.
Computer and video games	Mostly digital content sales (purchase of console games with Internet functionality) and subscription-based revenues. Increasingly advertising-based and selling of virtual items, etc.
Film and video	Mostly digital content sales (pay-per-view), with some examples of advertising-based business models. Increasingly subscription-based.
Music	Mostly digital content sales (pay-per-track) and some examples of advertising-based. Increasingly subscription-based revenue and revenue from concerts and some voluntary contributions.
News	Most revenue via online advertising or online classified ads and content licensing.
Advertising	Mainly search advertising (cost-per-click and cost-per-action models) and display ads. Increasingly behavioural advertising to target consumers.

Table 7: Digital contents offered on-line (OECD 2008)

We will attempt in our description of the mobile Internet and our three cases to unravel different revenue architectures. Graphical visualization is used to support an understanding of the relation between concepts in the framework. This will be a tool to analyse where and when innovation with service delivery platforms takes place in our empirical investigation. As stated by Baldwin and Woodard (2008) such graphical tools will assist in understanding platform architectures and assist in answering our research questions.

A cascading model could be depicted where individual technologies within the service platform affect the capability of the whole platform. Such technologies then influence platform capabilities and thereby pricing strategies and business models. We could therefore use our model as a framework to study how firm collaboration and technology innovation *within* the platform affects pricing and profits in particular multi-sided markets. Later in the thesis we will deploy this model in order to make contributions to current theory from our analysis and respond to the research questions.

At the boundaries, or what we call “borderlands”, among organisations we can characterise the exchange of information across borders by various mechanisms, ranging from imposed technical standards and formal contracting to shared business goals, open innovation and informal interactions. This model brings together approaches from the analysis of payment transactions and business models with innovation theory from an institutional perspective that focuses on the ambitions and expectations of actors and the organisational structures they design. We can think

of such borderlands of innovation with the metaphor of an estuary, as explained in the introduction. One area where we can investigate the notion of innovation at the borderlands is delivery platforms for the mobile Internet. Much of the academic literature on the subject stresses the significance of user-initiated innovation and the speed of proliferation of services where control over functionality is in the hands of those at the particular border between the Internet and the user, as opposed to being within the network itself. The trend in the mobile service market is increasingly "smarter" devices, enabling improved client computing. If we integrate our approach to innovation with our analysis of business models we can extend our thinking about the boundaries between firms to value chains and networks. We differentiate between innovation seen as a product of in-house activity and that seen as a feature of such interaction. In those industries with the greatest dependence on research and development such as pharmaceuticals, sources of innovation have moved from almost self-contained and usually secretive R&D activities to more inter-connected activities sensitive to a wider range of influences (Chesbrough 2003). As mentioned in earlier sections, ways to describe industry dynamics are large technological systems (Hughes 1983), structured dialogue (Christensen et al. 2003), and industry architecture (Jacobides et al. 2006). Our model contains various exchanges, where payments in the forms of user fees and advertisements take place. In return individuals or companies get a particular service delivered. One or more actors operating a service delivery platform enable the exchange.

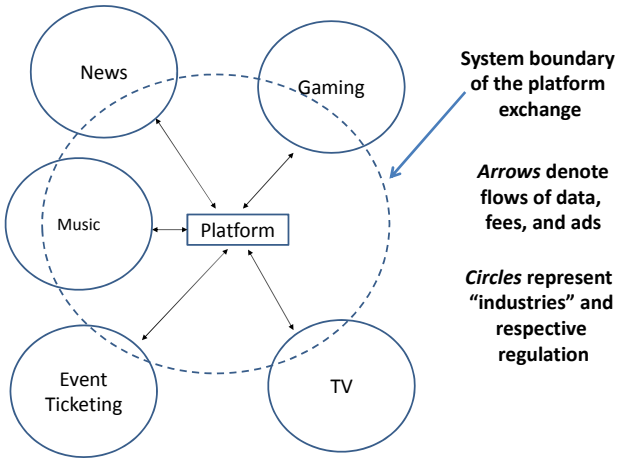


Figure 12: System boundary of a platform exchange; inclusion from different industries

Platform strategies could be based on price allocation between the two markets, rather than conventional cost-based pricing. In this way converging markets could be modelled in those cases where such exchanges and service delivery platforms exist. As outlined in the literature review, modelling of platform economics and related business models could be done when using the concept of multi-sided markets. We can picture

We can apply the two-sided market approach to the major technologies enabling the mobile Internet, which include the interfaces between infrastructure networks, handsets, and service (or content) delivery systems. However, the main technologies of interest to us are those encompassed within delivery platforms. If we can gain a deep understanding of how the capabilities of delivery platforms affect interaction between service providers and users (consumers), we could analyse how dependences between the two-sided market concept and the architecture of underlying platform(s) affect business models and industry structure. The target is to develop a general model of service delivery that could then be applied to subsequent cases. In the conclusions it will be discussed how this analytical approach could be expanded into a model for firms to understand their position within the network and to identify strategic options. The socio-technical interaction between firms and service delivery platforms could be summarized in three basic questions[7]:

- *What* technologies are involved?
- *Who* are the firms?
- *How* do firms and technologies interact?

This thesis attempts to marry the strengths of an economist's view of multi-sided markets (where pricing is well defined) with a deeper managerial and technical analysis of how platform architectures and value chain innovation create such two-sided markets. A framework with three

[7] The division of innovation and into different levels of analysis could find support in Swanson (1994) and Lyytinen/Rose's (2003) model of information systems innovations being divided into systems development (platforms), services (two-sided markets), and base innovations (basic technology components) respectively. Basic technology components would be the building blocks of platforms.

analytical levels will be deployed in this thesis to achieve such integrated analysis of the creation of two-sided markets.

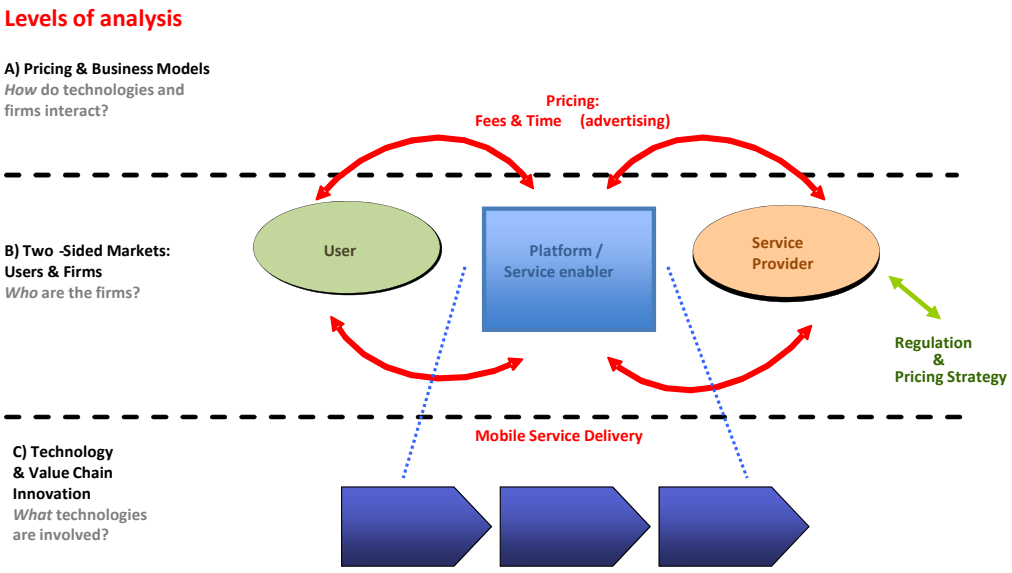


Figure 13: A framework for studying platform innovation

We note from the literature review that network externalities are central to concepts of digitalization and platforms, but not well explained by neoclassical economic theory. Further, we learnt how delivery platforms are related to concepts of multi-sided markets. As we apply a comparative perspective in our methodology by studying two different markets, we can complement the initial research questions to cover these considerations in the empirical chapters:

What technologies are involved?

1. How can firms utilize the Internet and digitalization of content delivery to support the creation of new service markets?
2. How can we use the concept of service delivery platforms and assess their role in mobile service innovation?

Who are the firms?

3. Where in the service delivery network do firms innovate and interact?
4. When have start-ups and established firms respectively played important roles in developing this new industry?

How do technologies and firms interact in markets?

5. How can multi-sided markets theory be used to describe business models under conditions of telecom convergence?

When and why does service delivery innovation differ between markets?

6. Certain products are free or hold a certain price in specific markets and this changes over time. Can we model why choices are different in different markets and industries?

Concluding remarks

In this first part of the thesis we started out by reviewing the academic literature of innovation, convergence in telecom/media industries, and the concept of "business models" for the purpose of framing our research questions. We started with Schumpeter via the resource view of the firm and how evolutionary economics and Hughes' systems view provides a basis for describing historic events and the dynamic effects of innovation. We also devoted particular attention to how the Internet, digitalization and ICTs support service innovation. The significant role of institutions for the telecom industry was laid out in the form of standards and regulation. Business models were explained in terms of the positioning of the firm in value chains (or networks) and how firms attempt to control the architecture of value and revenues.

The methodological approach married the literature review with considerations on how to carry out the research in a rigorous way in order to answer the research questions. A social constructivist approach to the relation between technological and social systems was deemed most appropriate for our purposes. We noticed that failure cases are also useful for our understanding of analysing innovation in evolving technology systems. A multiple case study was chosen as central element of the research plan and the methodological framework that is used for the empirical investigation. The framework could be divided into three levels of analysis: technology innovation, value chain innovation, and business model innovation.

Part II

The mobile Internet in context – UK and Japan

For the purpose of describing the innovation (or technology) system of smart phone services we first introduce the mobile Internet, then how mobile service delivery platforms developed, and finally exemplify two-sided markets and business models from Softbank in Japan and Vodafone in the UK[8]. This will paint the landscape in enough detail that we can focus on the specifics in our three cases in the next part.

The first section give answers on "*who are the firms?"* and provides a historic background to the mobile service industry, followed by an overview of firms involved, the effects of regulation on the industry, and an introduction of the UK and Japan markets (what Hughes describes as technological *style*, as outlined in the previous chapter). In this chapter we start to capture how firms from different industries and positions have different innovation paths.

Secondly, we apply Hughes' presentation of an evolving technology system in *phases* to explain how service delivery platforms have emerged: invention, development, innovation, transfer, and growth/competition/consolidation. This provides initial answers to "*what technologies are involved?".* In this section we analyse the supporting role of delivery platforms for service innovation.

Thirdly, we start to unravel *"how do technologies and firms interact?"* by describing Softbank in Japan and Vodafone in UK. We discuss how these firms are examples of how the mobile telecom industry has changed from being a one-sided market into multi-sided markets of converging products.

[8] Most of the concepts, interviews and archival research in this chapter started to take shape in a paper published 2002 in the first Global Mobility Roundtable conference in Tokyo (Kärrberg & Sigurdson 2002), then further developed during 2003-04 for a non-published conference paper destined for the third Global Mobility Roundtable 2004 in Austin; 2005-2006 a pre-study building on the earlier papers and new interviews and archival research was digested then published in the conference paper "*IT and Telecoms Convergence: Mobile Service Delivery in the EU and Japan"* (Kärrberg & Liebenau 2006). The section on Softbank in Japan was developed as part of an MBA course at London Business School convened by Prof. Leonard Waverman (2008).

Introducing the mobile Internet

The early years: network build-out and degrees of momentum

Japan's lead in mobile telephony goes back to the 1970s, and the UK has been an early adopter in several areas. The first commercially automated cellular network was launched by NTT in 1979. Within five years, the NTT network had been expanded to cover the whole population of Japan and became the first nation-wide analogue network. In 1981, this was followed by the simultaneous launch of the Nordic Mobile Telephone (NMT) system in Scandinavia (Swedish Technical Museum 2002). The UK launched its own system shortly afterwards. In May 1983 licenses were granted to Cellnet and Vodafone in the UK to provide national cellular radio networks. The first call ever placed on a commercial GSM (Global System for Mobile Communications) phone took place in 1991. In 1985 Japan took the first steps towards deregulation by introducing new laws leading to the introduction of so-called New Common Carriers competing with NTT and eventually merged into the company KDDI (Srivastava, 2001). In 1993 NTT had rolled out its PDC (personal digital communication) network, which was incompatible with GSM. GSM is often hailed as the foremost example of successful consortia-type standards/platform development in Europe. Advancing GSM as the world standard for second generation mobile telephony (2G) created an acceptance of politicized standards creation in Europe. In April 1994 Hutchison Microtel announced the launch of its UK network, Orange, based on GSM. From 1 January 1999, mobile phone customers were able to keep their old number when switching networks throughout Europe, and the UK was first out. Japanese manufacturers attempted to spread PDC as a competing standard for 2G, but failed. This left Japan outside the GSM world, resulting in international roaming and interconnection challenges until 3G was introduced in 2001.

Texting and the dawn of premium mobile contents

What was to be a major source of revenues for operators in Europe, text messaging, was introduced to the UK in 1992. In other parts of Europe Nokia's dominance as handset maker resulted in Finland being a leading market. The mobile phone became a mass media channel in 1998 when the first ringtones were sold to mobile phones by Radiolinja in Finland. Soon other media content appeared such as news, videogames, jokes, horoscopes, TV content and advertising. In Norway such paid-for (premium) content services delivered via SMS became

popular, spurring start-ups in the area (Nielsen 2006). Mobile payments for physical goods were also trialed for the first time in Finland in 1998 when two Coca-Cola vending machines in Espoo could receive SMS payments.

The advantages or offering Internet access compared to desktops or portable computers were thought to access while on the move and to utilize the fact that users already had a billing relation with their mobile operator. While the advantages were obvious, so were some of the disadvantages: small screen and keyboard, limited computing power, and the incompatibility of standards.

After European domination of the international mobile telecoms industry the first half of the 1990s, the number of subscribers in the South East Asian markets exploded towards the millennium and the momentum shifted: China became the world's largest market in terms of subscribers and growth (Kärrberg & Almström 2000); at the same time Japan became the leading market for mobile Internet services. In 1999 Japanese mobile operator NTT DoCoMo introduced its mobile Internet service, called "i-Mode". One of the IT base innovations (Lyytinen & Rose 2003) behind i-Mode was GPRS (general packet radio switching) that enabled "always-on" data functionality: it enabled operators to charge per data packet rather than so-called "circuit-switched" systems where you can only charge the customer per time unit. Japan was first out with GPRS and pioneered integrated micro billing system. Micro billing means that users could subscribe to contents on monthly subscriptions, and the data charges and subscriptions were included in the monthly mobile phone bill. The network of firms involved in providing the first i-mode portal could be summarized below:

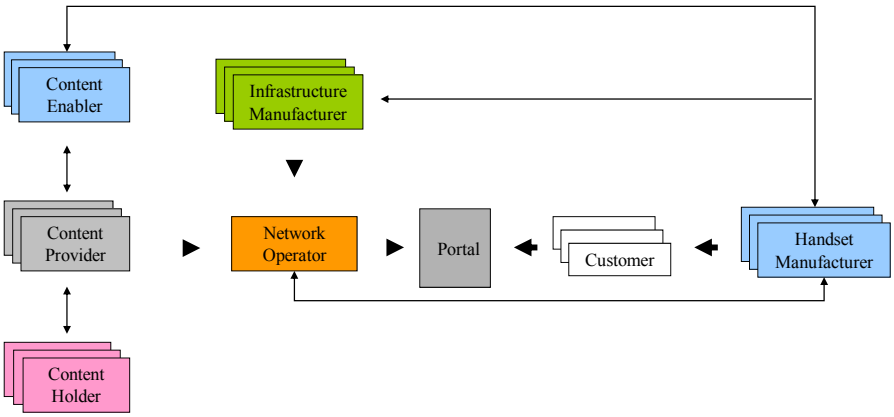


Figure 14: Network of firms in the i-mode value chain

In 2001 Japan was first out again: this time with a commercial launch of 3G (third generation mobile communications system, another IT base innovation) by NTT DoCoMo (called "DoCoMo" from now on in the thesis) on a modified version of the WCDMA standard. DoCoMo quickly gained a leading voice in the Third Generation Partnership Project (3GPP), an organization working to promote WCDMA as a third generation standard (Funk 2004) and in the WAP Forum, later merged into the Open Mobile Alliance, developing industry standards for mobile services. In 2001 downloadable java applications were launched by Japanese operators, inciting a sharp rise in revenues from mobile content downloads. Vertical integration among Japanese operators, extending into technical leadership in specifying handsets, was a key difference compared to Europe and the US according to Srivastava (2001). Christensen & Raynor (2002) rather define DoCoMo's role as controlling the value chain without engaging in vertical integration. The latter relate to findings explained further in the coming chapters.

As growth rates from voice revenues started to dwindle, operators in developed markets set their hope to mobile services instead. The introduction of 3G in Europe and the US changed the focus in standard competition to the application layer (Tilson & Lyytinen 2006; figure 54 describes the TCP/IP layers), as was the case already in Japan[9]. At the same time in Europe, users became increasingly aware of handset capabilities in order to access the Internet from their mobile phones. However, lacking computing power and the large range of capability among handsets (including a mix of black and white with colour screen enabled devices and a plethora of sound file standards), made it necessary to adapt contents on the server side, rather than only on the client side. Therefore service delivery platforms became increasingly important for carriers and content providers in order to capitalise on the promise of the mobile Internet.

The firms enabling the mobile Internet

From our introduction above we have divided firms providing mobile services into the following groups: portals, network operators, handset providers, infrastructure providers, and content providers. Content providers are further divided into content holders, content enablers, and

[9] Higher speeds in the networks and technology driving services were the focus in Europe, expressed in the spectrum auctions that raised £22.5bn in the UK alone (National Audit Office UK 2001).

content distributors (content providers). In the following their positions in the market and paths of innovation in the industry are outlined:

The operator portal

Portals were central to launch strategies among network operators 1999 onwards. The menu that the customer accesses from his or her cellular phone corresponds to the portal. The carrier owns the portal and is dependent of the handset manufacturers and content providers, which enable the customer to access mobile Internet services at the portal. Most network operators still operate portals, but their importance for revenue streams decreased steadily until 2007 when smartphone users access the Internet directly or through application stores instead (Root 2010).

Network operators

The primary business of operators is to own and provide access to their networks. They compete with each other by offering data access on handsets they often subsidize to users. Common for all operators from 1999 onwards were their closed portal with services offered exclusively to their subscribers. The carriers in Japan had more influence over handset manufacturers, content providers and customers than their European counterparts.

Handset manufacturers

Handset manufacturers are, naturally, dependent upon links to the customers who buy their products. These are typically the operators who buy network infrastructure and retailers that distribute and sell their terminals. In addition they may have links to application developers in order to encourage applications to be ported to their own hardware infrastructure, solutions and operating systems. Handset manufacturers develop their own software for the operating system and the browser, or license it from other software companies.

Infrastructure manufacturers

This category of companies supply operators with infrastructure needed to operate mobile telecom networks. The infrastructure manufacturers are dependent upon the overall success and usage of mobile networks.

Content providers

Mobile phone content can be described as the words, sounds, and pictures that the users experience when they go online. News, games, and music are some examples of content provided to the user. The content providers are companies that supply one or more carriers with mobile Internet services. From having been mainly start-ups at the dawn of the mobile Internet, large retails brands increasingly invested in mobile services themselves.

Content enablers

Another group of content providers are those who make browsers (applications that enable users to surf the Internet), middleware (software tools that applications utilise in order to “speak” to the hardware), database access programs etc. They are not directly involved in publishing content in the portal, but enable this through their software technology. They are referred to service delivery platform providers in this report. Mobile service delivery technologies have become the glue between previously secluded "telecom" and "IT" sectors.

Effects of regulation

Regulation generally has large effects on the telecom industry due to a history of monopoly, public ownership, public service objective, bottlenecks, and interconnection issues. The World Trade Organisation (WTO) has driven telecoms regulation on a global level, where members have committed (at various levels) to extend competition in basic telecommunications, and some to regulatory principles that reflects best practice in telecoms regulation (WTO 2011). The International Telecoms Union (ITU) is the United Nations agency for information and communications technologies, and the forum where global standards are agreed. In the 1990s the US pushed ITU towards unified forms of regulation and standards, such as Wide Band CDMA (W-CDMA), the standard that is generally referred to as 3G (ITU 2011).

The fixed-line (telephony and Internet access) access market is subject to extensive regulation compared to its wireless counterpart. Reasons for this are amongst others regulatory priorities for access to markets (a single market in the case of EU), fair competition (anti-trust and monopoly), and universal access and inclusion for citizens. Mobile broadband services are becoming more popular, but they do not always offer competitive prices and speeds when compared to fixed line access (ITU, 2008). In Europe 2007 only 2% of broadband connections

were provided by mobile services. This explains why regulatory pressure on mobile access has not been a high priority by the EU Commission (Huigen & Cave 2008). Therefore mobile broadband and wireless services have been exempt from key policy goals in terms of uptake, costs and related regulation for next generation broadband services. This is exemplified in drafts by the EU Commission circulated mid-2010 for its Next Generation Access recommendation (Liebenau & Kärrberg 2010).

The telecom act of 1996 in the US set precedence of facilities based competition in contrast to service-based competition in the fixed broadband domain. The nature of competition in local access networks is shaped by "build or buy" decisions among entrants (Bourreau & Dogan 2004). Companies engaged in facilities based competition own their own infrastructure, and contracts are established for interconnections. Service-based competition means that new entrants rent capacity from owners of the facilities. However, fixed line telecoms and broadband firms often suffer from access bottlenecks in the local loop (which is often owned by one company) and monopoly aspects further hinder the competitive situation from being solely facilities based (Röller & Waverman 2001).

In principle, mobile telecommunications differ to fixed line telecoms in that mobile operators largely possess their own critical infrastructure (such as base stations), so it is in theory possible to apply a model closer to facility based competition. Specific regulatory issues for mobile services according to Waverman (2008) are: mobile services are traditionally marketed as distinct from fixed telephony; competition usually results in low/heavily subsidised handset prices and contracts; usage rates high and calling from fixed phones often expensive; and international roaming. An increasing challenge for regulators is to model the regulatory landscape as operators engage in two-sided and multi-sided markets involving TV, mobile, fixed telephony, and broadband.

More specifically regulation focus on the following business aspects: price control, license conditions, competition policy, numbering administration, international roaming, and service restrictions (emergency calls to mention one). Call origination and termination costs between networks are also constant sources of controversy between large networks and their smaller competitors.

Regulations allowing mobile phone subscribers to switch carriers without changing their phone numbers were introduced in the UK already 1999 by Ofcom. Various regulatory institutions affect mobile service regulation, especially in terms of premium rate (charged-for) contents in the UK[10]:

> "The regulators affecting mobile services could be summarized in: Ofcom, gambling commission, Icstis, DTI, DCMS (culture, media, sport), FSA, trading standards, OFT (office of fair trade), and ASA (advertising standards authority). The single most affected area is content and access regulation for 18+ year old services (adult, gambling etc)."

A business manager both active in Japan and Europe added in 2008 that privacy was becoming an issue for users[11]:

> "So far we haven't seen so much regulation. The Internet is pretty unregulated. It could be likened to that values are converging globally, but diverging on a local level. Privacy e.g. has more to do with what kind of users you deal with than what country. Tech-savvy users are more aware of how information could be abused. Japanese people are a little extra careful though compared to Europeans. They are careful especially when it comes to revealing their identity."

He continues:

> "A hot topic in Sweden now [summer 2008] are the new laws giving the military access to international Internet traffic. That contributes to users losing trust in the Internet and could affect how they use it".

Privacy was a less important aspect of regulation when the first mobile services were launched. Due to an abundance of more advanced services in Japan, regulation took shape earlier than in

[10] Interview with Mr. Suhail Bhat, Mobile Entertainment Forum (2007)

[11] Interview with Mr Peter Arvai, July 2008

Europe. Mobile devices offer opportunities to collect and generate large amounts of significant, potentially commercially valuable, and sometimes intrusive personal information.

The UK market[12]

The UK was among the first EU countries to liberalise its telecoms market. Since privatisation, network coverage has improved, prices have fallen and new firms have emerged, particularly in the mobile-phone sector. Penetration rates for mobile phones and the Internet are lower than in the Nordic countries, but higher than in France and Germany, with both markets close to saturation. The UK is an interesting market because it includes Europe's largest operator groups (Vodafone, O2/Telefonica, France Telecom and T-Mobile) and two of the world's most creative operators, 3 and Virgin Mobile.

The UK telecoms market is highly competitive and highly saturated. 2011 saw T-mobile selling its network to Orange in the UK, and a new company, "Everything Anywhere" (EA) was formed. As a result the number of large operators (more than 10 million subscribers) decreased from four to three – Vodafone, O2, and EA, followed by "Three" with some 4 million subscribers, and Virgin Mobile with some one million subscribers (a mobile virtual network operator). Mobile penetration rates in the UK exceed 120%, limiting the scope for further growth on the revenue side to pricier data services and on the hardware side to handset upgrades and replacements. The mobile market has enjoyed strong growth in messaging volumes in recent years. Text messaging is more popular in the UK than in most other west European countries. As 3G phones have gained in popularity, the availability of services such as video and music downloads, alongside Internet access, has provided new revenue opportunities for mobile operators. After the launch of Three and its X-Series service in December 2006, UK operators started to become more aggressive in mobile data prices and services (Informa Telecom 2008).

Following the launch of Apple's App Store in mid-2008, a host of handset manufacturers (Samsung, Nokia, Palm and BlackBerry) launched application marketplaces in the first half of 2009. Of the approximately 80 million subscriptions in 2010 the largest operators were

[12] Most of the data is taken from Economist Intelligence Unit (EIU 2011b) and iDate "Digital Yearbook 2011" (Pouillot & Ollivier 2011)

Everything Everywhere (the joint venture of Orange and T-Mobile, with 37% of subscribers), O2 (25%) and Vodafone (20%)In terms of the mobile market. UK-based Vodafone is one of the world's largest mobile communications firm by revenue, and the second-largest (after China Mobile) in terms of proportional customers. There were an estimated 20.6m Internet connections at the end of 2010, of which around 94% were broadband. An estimated 75% of households have access to the Internet at home, while penetration of personal computers (PCs) is around 83%. The mobile penetration had reached saturation, as in Japan. The UK is expected is maintaining its lead as one of the world's heaviest online shopper and expected to. Despite the country's pioneering role in developing much of today's electronics industry, little of it now remains in the UK or in UK hands. Other than Vodafone, there are no major telecoms or hardware companies listed on the FTSE 100 index. ARM, based in Cambridge, designs and sells microchip blueprints to semiconductor firms worldwide. Vodafone has turned its focus increasingly towards emerging markets in Eastern Europe, Africa and Asia away from maturing markets in Western Europe. It entered the Japanese market in 2001 when acquiring J-Phone, but exited by divesting to Softbank in 2006.

Telecom regulation in the EU and Britain

European telecoms liberalisation was driven during the 1990s by the EU Commission in its goals towards the single market and to support increasing trade with telecommunications products. In this sense the goals of WTO and the EU Commission coincided in 1996-1998 and became a formidable liberalisation force. Parts of Europe liberalised their telecom markets in 1998, and the UK in 2001. In other European countries, mainly Italy, Germany and France, the privatization of incumbents and creating independent regulatory bodies spawned challenges. The EU and its approach to regulation of monopoly platform markets have resulted in well publicized court cases of late (EU Commission 2011): Microsoft, Google, Apple, and lately Orange and T-Mobile (2010 in the UK) have all been subject to investigations.

The EU regulatory framework applies "Equivalence", based on functional versus structural separation. It relates to the idea of network neutrality, i.e. all service providers should have access to deliver services on networks owned by an incumbent. As operators typically compete with each other telecom regulators focus most of their attention on competition policy. In all markets, there exist monopolistic aspects of telecom network ownership due to the state-

ownership of the copper network and in many cases the first built out mobile network as well. UK is an exception in that the regulator forced BT to sell its mobile arm, which turned into O2 and subsequently taken over by Spanish incumbent Telefonica.

The UK regulator Ofcom is operating independently from Ministry of Transport and Communication. It has divided the equivalence principle into practical guidelines in product-level equivalence and operational separation. The first implies that other operators have access to the same regulated wholesale products as British Telecom (BT). Operational separation means that BT must separate units providing bottleneck products addressing incentives and means for unequal treatment. Ofcom's principles of regulation follow are in line with EU directives and could be summarised in the following (Waverman 2008); (Blowers 2009):

- Regulation directed towards competition and consumer protection
- Regulate only when necessary
- Regulatory tools adapted to extent of competition
- Technologically neutral
- Coherent and consistent
- Light handed
- Network competition versus services competition

The Japan market[13]

Japan is currently the world's second-largest market (after the US) in terms of total IT spending. In the information and communications technology (ICT) equipment sector, Japan is home to a number of global brands, such as Sony, NEC and Fujitsu. Japan accounts for around 20% of global telecommunications spending, but the market is mature. Around one-half of Japan's population of 127m lives in the capital, Tokyo, Osaka and Nagoya. As many of these people live in apartments, broadband access and installation is made simpler.

[13] Most of the data is taken from Economist Intelligence Unit (EIU 2011a) and iDate "Digital Yearbook 2011" (Pouillot & Ollivier 2011)

Foreign players have a presence in Japan, but it is still dominated by domestic firms. Operators in Japan procure 3G handsets from Motorola, Nokia, and Apple, although adoption of foreign-made products has so far been limited. A local telecoms and Internet services provider, Softbank, had exclusive rights to sell the iPhone in Japan, which helped the company's sales to rise by around 3% year on year in the first nine months of fiscal year 2009/10 (April-March). In 2009 DoCoMo responded to this threat by introducing a smartphone that uses Android software designed by Google. In mid-2008 DoCoMo and Google launched a service whereby Google became the default search window on DoCoMo phones. KDDI au, which has the second-largest market share in Japan, already had a similar arrangement with Google.

Japan's handset makers are experiencing problems in overseas markets—a withdrawal from China has been ongoing since 2006, and the country's only significant global player is Sony-Ericsson, a joint venture between Sony, and Swedish Ericsson. Overseas sales would help to improve manufacturers' economies of scale.

Regulation in Japan stems directly from Ministry of Information and Communications (MIC) and some analysts claim they have supported DoCoMo's dominance in the market (over 50% market share). One argument would be that standards setting would find economies of scale with one operator controlling more than half of the market[14]. MIC focused in the 1980s and 1990s on providing these stable market conditions to build a strong national innovation system. However, in recent years globalization meant the Japanese market was not enough anymore to get economies of scale for infrastructure. Instead Ericsson and Nokia became key suppliers alongside NEC when eMobile launched its new 3G network in March 2007.

Telecom regulation in Japan

Already in 1985, NTT Public Corporation was privatized and Japan's telecommunications market was opened up for competition. However, NTT DoCoMo controlled most national R&D resources and in the 1990s kept new standards from disseminating to competitors as a means to control this competitive pressure from new telecom firms, such as KDDI[15]. Fransman (1995) calls the incumbent NTT's way of shaping the competitive environment in the Japanese telecom market

[14] Awoyagi Tadashi, interview (2007)

[15] Awoyagi Tadashi, interview (2005)

until the 80's 90's, "controlled competition", referring to cooperation between a NTT and large competing suppliers. This influenced the structure of the telecom industry in Japan and not until the end of the 90's did foreign companies have any influence on the market.

Since the mid-1990s, the Japanese government has regulated towards giving so-called "new common carriers" easier access to NTT's network, especially by promoting a reduction in interconnection charges. Between 1994 and 2002 Japan had managed to reduce its interconnection charges between networks more than the EU in average. Since the late 1990s "Japan has undertaken a series of reforms on interconnection to enhance competition in the telecommunications market" according to Suda (2005). He further concludes that relatively swift regulatory reform was the result by global market pressure transmitted by large business users, rather than pressure from outside Japan, such as WTO. Ministry of Internal Affairs and Communications that direct regulation has formulated strategies and priority policy programs including the January 2001 "e-Japan Strategy" aimed at "making Japan the world's most advanced IT nation within five years" (MIC 2010).

The "Privacy Mark System" in Japan is in compliance with Japan Industrial Standards and accredited firms are as of 2007 obliged to report breaches to the administrative body JIPDEC (JIPDEC 2007). Serious breaches including personal data and credit card information must be reported directly to the Ministry of Economy and Trade (METI). Privacy on the mobile Internet has been taken seriously in Japan by the regulator and service providers. In this sense privacy became an issue much earlier than in Europe, due to more advanced and potentially intrusive services (with extensive loyalty schemes and location based services e.g.). There is a long culture of hiding one's identity from the authorities in Japan, dating back to the intrusive era of the Japanese Shogunate (from the early 1600s and onwards), who monitored citizens and social interactions thoroughly. The objective of the Shogunate government was to mitigate civil war and unrest, which had kept Japan in the so-called all-Japan war for more than a hundred years until the early 1600s.

The emergence of mobile service delivery platforms

In this section we apply Hughes' way of presenting an evolving system in *phases* to explain how the mobile Internet came to be: invention, development, innovation, transfer, and growth/competition/consolidation. Such system evolutions do not always happen in that order, but it serves the purpose of identifying components of the mobile Internet system. Referring to our framework it seeks to answer the question of "*what technologies are involved?*"

Invention

Mobile service delivery as an industry took off in 1998, shortly before the launch of i-mode in Japan and its corresponding WAP services in Europe. Plain messaging (SMS in Europe and email in Japan) attracted most users and the highest volumes of sales and non-voice traffic in 1999. When the mobile Internet became available in both Europe and Japan, delivering content was a disruptive set of technologies (Christensen 1997) for all content holders but new content start-ups. None of the contents (images, sound, text) used on the Internet could easily be applied on mobile phones due to different browsers, mark-up language, file formats, or due to general constraints from the handsets. Japanese operators early on recognised the existing clusters of gaming, music and other entertainment services, and focused instead on billing and the overall quality of their service network.

Products in which there is little or no value to the first users due to the existence of strong direct (e.g., telephone) or indirect (complementary products such as mobile commerce) network effects face a significant start-up problem (Economides 1996). According to Funk (2006) the Japanese and to a lesser extent Korean service providers early on solved the start-up problem of direct network effects with entertainment content that was supported by a micro-payment system (service providers collect and pass on content fees to content providers) and custom phones that displayed this content in a consistent manner. The second start-up problem in Japan and Korea of indirect network effects were addressed by Internet mail according to Funk (2006) that was modified for the small screens, low bandwidth, and low processing power of phones (called "push-based Internet mail").

In 1999 European operators only offered premium SMS as charging method and "click-through" payments for users who surfed the Internet on their phone. In Japan the operators created their

own portals where users could subscribe to music, news, and games and pay on their mobile phone bill. Even if European firms attempted to solve the reverse salient of core standards (the WAP project) there were a plethora of incompatible interfaces contributing to the first and second start-up problem mentioned by Funk. Radical as defined by (Hughes 1987) are defined as inventions that do not become components in existing systems. This was the case 1999 in Europe. A response to these incompatible technologies in Europe was to either introduce complete new systems (such as the attempt to introduce i-mode in Europe) or to establish gateways (Hanseth 2000) to bridge these incompatible systems to increase the network effects and throughput.

Most resources for creating applications/software could be divided into actual software (application) creation, and "porting". With porting is understood that core applications need to be adapted so they can run on different hardware and operating systems. The trouble with mobile devices is the many operating systems and hardware specifications, and this situation was even more troublesome in 1999. In order to automate as much as possible of the porting, service providers started to develop their own, or used a partner's gateway to resolve this problem. Such gateways were often referred to as so-called delivery platforms in the industry (Taylor 2005) and were server products installed between the application servers and end-user mobile phones.

The major technologies enabling the mobile Internet can be thought to be, and include the interfaces, between: Operator networks, application servers, service (content) delivery systems, and end-user handsets. Each handset manufacturer in Europe had proprietary content standards for their handsets in 1999. Service delivery platforms therefore developed as internal platforms in Europe among operators and content providers at the same time with relatively limited 'cores' and large amount of 'peripheral' set of complimentary and high variety components (Tushman & Murmann 1998). In Japan the handset manufacturers had to tailor their handsets to the three operators, so application developers had an easier task.

The development of delivery platforms as product offerings was initially slow 1999-2001, but for different reasons in Europe and Japan: in Europe because of sprawling standards and eventually the "telecom crisis" 2001 onwards; in Japan because operators had established three sets of standards (portals) and contents were relatively simple resulting in lower porting costs. Many

Japanese content providers instead sold their content to content aggregators, who had the relationship with and delivery capacity to operators.

Unit costs of delivery platforms were high in Europe compared to their utilization grade. As service deliver platforms were also a bottle neck in the mobile Internet system in Europe the load factor (Hughes 1987) was relatively low, resulting in low returns on investment. Arriving 2001-2002 when the venture capital flow decreased during the "telecom crisis" many mobile service providers in Europe went bankrupt due to a low load factor in the Internet, and the mobile Internet technology system in particular (Business Week 2001). In Japan where network effects were achieved much earlier, there was instead an incremental and steady increase of user spending on mobile Internet services. The "telecom crisis" never reached Japan.

There were at least three technical reasons for delivery platform providers to consider: firstly to adapt the content to a multitude of different device capabilities (screen sizes, file formats, colour schemes); secondly to deliver it to mobile user devices through mobile carrier networks (where users are not always on-line); thirdly, micro billing in order to charge users for content on their mobile phone bill. We therefore consider these three activities, or technical architectural components, as the platform 'core': device adaptation, service delivery, billing. Mobile service delivery platforms were around 1999-2000 mostly deployed by mobile operators and gradually by other service providers. Device adaptation was early on offered as a service by providers in Europe. Payment was only done by operators in Japan as they did not share the billing interfaces with external providers (enabling premium SMS), as operators in Europe.

The core value for an operator is to control the subscriber and billing relationship, then to find partners who can assist in creating new value add. An operator typically generates revenues in two ways from the mobile Internet: Inside its own portal, where service providers offer content hosted in their own environment; and as "off-portal service", where the operator only gets revenues from the data transfer (including SMS) over their network. Japanese mobile operators coordinated standards in coalitions that included handset makers and content providers, but without mediating all transactions themselves. With Eisenmann et al.'s (2009) definition they could be seen both as a billing platform provider, but also as platform sponsors managing the end-users with limited openness on the supply-side: any provider could provide i-mode services,

but in order to utilize the micro billing opportunity the provider needed to be accredited by the carrier and on the portal.

We can divide a mobile content service into two components: The actual service or content in the form of a file or site access, often protected by some intellectual property right; the service delivery mechanism. It starts from its origination with a content holder and terminating on the mobile phone. Further, our descriptions of delivering mobile services can be simplified into at least the following activities or functions as we will call them:

Content ownership: The creation and possession of analogue/digital contents
Content aggregation: Aggregation, pre-formatting and storage of content for the purpose of service delivery
Service delivery: To deliver contents in the right format to any handset.
Billing mediation: Charge any customer for contents according to regulations and purchase event.
Portal management: To present an attractive portal where users consume contents. Deployment of search engines displaying the portal's content in a compelling way.
Content approval, network access: Approval process and guidelines for content before going live on the carrier network.

A conceptual model of the service delivery mechanism is provided below:

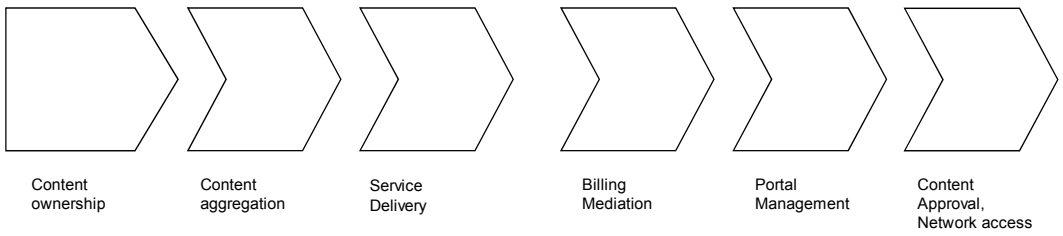


Figure 15: The activities (functions) involved in mobile service delivery

Development

By 2001 the mobile Internet system in Japan had gained momentum and every month tens of new services were added to the carrier portals. Europe was clearly playing catch-up with many telecom executives paying visits to Japan in order to learn. One lesson from Japan was that

consumers seemed more interested in entertainment services than business services (such as mobile banking). Plain messaging (SMS and email) and Internet surfing still provided most revenues for the operators in Japan, but entertainment services, music and gaming download services. Below description of the development of data services in Europe from the beginning of the 1990s up to 2007:

The creation of new non-voice services and revenues has been a holy grail for mobile operators since the late 1990s. The mobile industry has gone through a number of distinct phases as it seeks to unlock the potential of new services: 1. **The early 1990s**: SMS is a rarely used – and never advertised – feature on mobile phones. 2. **The mid-to-late 1990s**: SMS takes off in the youth market, principally as a cheap alternative to voice and as a 'secret' language. The ability to text to someone on another network (i.e. network interoperability) is crucial to this growth. 3. **The mid-to-late 1990s**: Mobile operators seek (unsuccessfully) to develop a mobile Internet (WAP) in the full expectation that it will replace SMS. 4. **The late 1990s to 2001**: Operators roll out 2.5G (GPRS) networks and bid billions of dollars for 3G licences to support new services. Most business plans assume that mobile data revenues will reach the same level as voice within five to 10 years. In the meantime SMS usage and revenues soar. 5. **2001-2002**: The tech bubble bursts in Europe and operators scale back 3G investment plans. 6. **2003-2006**: Operators launch 3G services in the hope that games, music and video will fire consumer interest. Operators heavily subsidise 3G devices but, despite reasonable take-up of 3G handsets, usage levels remain extremely low due to a lack of compelling services, the high price of both access and content services, slow speeds and poor user interfaces on 3G devices. 7. **2002-2007**: Premium SMS establishes itself as the preferred means of delivering and billing for 'first generation' mobile entertainment services such as ringtones.

Table 8: Development of mobile data services in Europe until 2007 (Informa Telecom 2008)

Japanese carriers shared around 90% of content charges with the providers and kept the data charges for themselves, European operators kept 25-50% of the premium SMS cost (which included both content charge and delivery cost). In Europe operators reaped most of their profits from bulk SMS, which constituted a natural "incentive gap" between carriers and content providers, as the latter made money from content charges. This further added to the start-up problem in Europe.

In 2001 much technical progress had been achieved since 1999 but the service delivery platforms were still at the time seen as a bottle-neck (or 'reverse salient' in Hughes' terminology) on its way to be corrected both in Japan and Europe. There were several steps before even a standard music file (such as MP3) could be delivered from a content provider to different handset in a correct way. In Europe the content was expensive, difficult to use, and of poor quality. As mobile Internet access generally failed in Europe, SMS came to take over again as delivery format during 2002-2005. Until 2005 the mobile Internet (WAP/i-mode) experienced a revival due to better technology and interest from media companies to offer users a richer experience. Between 2002 and 2005 a general design (even though not yet dominant) of service delivery platform technology architectures crystallized. Ingestion and search engine are peripheral elements with others 'core':

- **Ingestion:** Analogue and digital contents converted into suitable digital format
- **Content management system:** When compressed into the right formats, contents are stored in a content management system.
- **Device discovery:** From the user agent, the SDP can identify the handset.
- **On-the-fly trans-coding:** For images, an on-the-fly trans-coding can be done from one raw file into the format fitting a certain user profile. It means that while phones are accessing a web site, images are converted into the file formats the phone is able to show on the screen at the right size.
- **DRM:** Before being delivered contents are wrapped in metadata deciding what rights the user has (e.g. forward-lock). Depending on handset capability and operator specification,
- **Billing mediation:** To check if the user has money to spend, and log his purchases with the carrier who provides the monthly statement or subtracts from prepaid user accounts.
- **Search engine:** When new content is added, it is being registered in the search engine, content providers can bid for key words, and users easily find what they look for.

We can now map the activities in previous figure against underlying technologies:

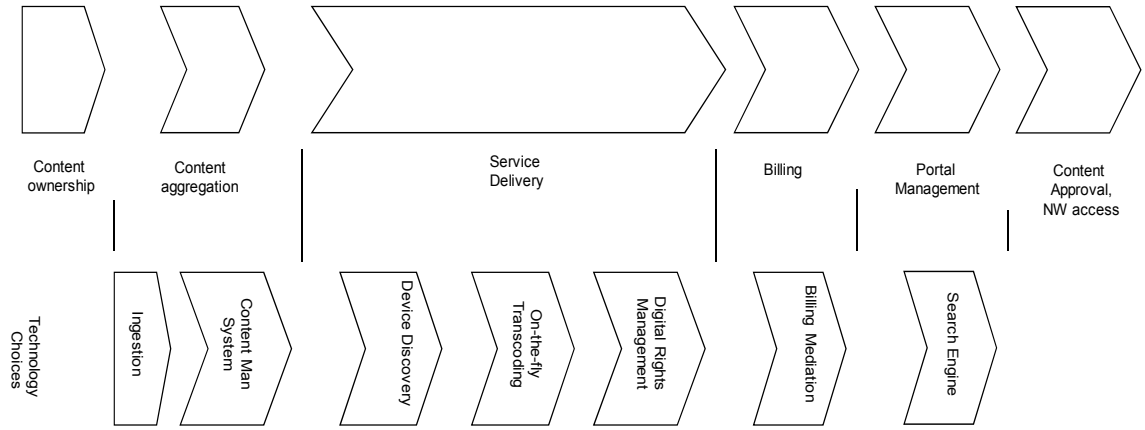


Figure 16: The technology components for mobile service delivery platforms

Content aggregators specializing in carrier relations developed both in Japan and the EU, and took off in Europe 2001 with premium SMS. The service delivery platform market emerged in Japan as a clear industry segment in 2002-2005, and somewhat earlier in Europe.

Innovation

2005 in Europe resembled the Japanese market around 2001 where the majority of the technical problems associated with content delivery had been solved and there was little differentiation between the functionality of the various platforms (Taylor 2005). Content protection and automated tools for creating campaigns (recipient lists, collection of responses) became standard features. As commercial aspects and system integration became more important than the technical architectures themselves the focus shifted to capturing and managing content metadata, setting up seamless end-to-end user experiences, and scalability of the offered solutions. As competition grew between operators and retail brands, commercial departments rather than technical developers increasingly got in charge of strategy planning. Delivery technology had become one aspect of how content was made relevant to individual users (Taylor 2005).

Funk claims (2004) the mobile Internet was disruptive for desktop Internet content providers, as they had to simplify their contents for small screens and keyboards, thereby creating a discontinuity with the previous service. Funk continues by showing how this enabled new

entrants into for example mobile shopping, by firms who are relatively weak in the desktop Internet services like Tsutaya Online (records, books) and Index (perfume) in Japan. In this way technologies can be disruptive for some firms and not to others.

From our interviews in the pre-study there were at least four key driving forces for integration and convergence between the mobile and fixed Internet in 2005-2006 (Kärrberg & Liebenau 2006):

1. "The fourth screen": After the TV, PC and cinema screen, mobile phones became an established marketing channel for search engines, advertisers, and media companies
2. Delivery control: Established media companies and device manufacturers wanted to deliver their content through their own portals, not only via carriers.
3. Technology standardisation: Technology components of the service delivery platform had become increasingly standardized decreasing the coordination cost for value chain integration.
4. Product standardization: Carriers increasingly wanted to buy standard and exchangeable components after many experiments with small and proprietary systems.

As new content delivery technologies enabled desktop actors to deliver content to already existing phones on the market, network effects provided positive feed-back processes between users and providers (Grindley 1995). Due to previous success the EU carriers and service providers focused on business users and expensive devices for their first WAP services (business users and roaming was the most profitable user segment). The low replacement rate of handsets and lacking customer relationship management from carriers towards service providers in Scandinavia (the leading market 1999-2001 exemplified how network effects were kept back from work in Europe (Kärrberg & Sigurdson 2002). Japanese carriers had an early success among entertainment contents, with service providers focusing on young users and consumers. There was also an early focus on performance-based positioning of contents in the i-mode portal, which provided trust with the users and clear incentives for content providers.

As mentioned by Funk (2005) and by the team behind establishing i-mode in Japan (Matsunaga 2001; Natsuno 2003) email contributed to i-mode and the mobile Internet success in Japan.

However, a financial analysis of messaging revenues shows that Western European carriers in 2003 had similar revenue per user than in Japan, providing an incentive for European carriers to continue focusing on SMS in the short term (Funk 2006).

Transfer

The mobile service value chain and related business strategies can be analysed by studying the main actors and how innovations are transferred into a larger technological system. With content enablers we henceforth mean delivery platform providers; and with content providers we mean either mobile content aggregators or retail brands. This leaves us with four main actors as mobile services transferred into becoming a mainstream media channel. They all have overlapping and unique core competences: carriers run their networks and bill customers for accessing them; mobile content aggregators specialise in finding and deliver content to carriers or directly to customers; vendors of service delivery platforms focus on technology and delivery mechanisms; and retail brands look to expand their product range to existing and new customers through the mobile distribution channel.

High coordination costs in Europe kept content providers from expanding cross-border sales, as incumbents all had different billing systems, portal policies and regulations. Initially therefore the larger size of the EU market didn't have any positive effects for mobile services sales compared to Japan (Kärrberg & Liebenau 2006). This internationalization of content sales in Europe (and bureaucratic carrier organisations) gave birth to SMS and WAP billing brokers. They offered one billing interface to service providers, enabling them to charge customers from many billing platforms/operators across Europe. Alternative payments did not happen in Japan until 2009 with iPhone (through credit card payments) as carriers did not allow off-portal billing. This could be seen as a complementary, but not "core" to most platform value chains in Europe.

Western telecom infrastructure providers (Nokia Siemens Networks, Ericsson, and Alcatel/Lucent), also deployed service delivery offerings as they moved aggressively into maintenance of carrier network. This vertical integration made it increasingly difficult for smaller SDP vendors to survive due to increased cost pressure and service demands. Retail brands also built their own portals in Europe and charged for contents via premium SMS. Encouraged by the success of i-mode in Japan, DoCoMo decided to grow overseas at the time of 3G introductions.

Between late 1999 and 2001, the company spent approximately ¥1.9 trillion to acquire minority stakes in AT&T Wireless and other overseas mobile carriers. However, the investments coincided with the downturn for the telecom sector, and DoCoMo were unable to convince overseas partners to adopt i-mode. DoCoMo was forced to write off ¥1.5 trillion of its investments, and instead decided in 2004 to focus on partnerships. In December 2004 DoCoMo had the following partnerships abroad:

Company Name	Country
E-Plus Mobilfunk GmbH & Co. KG	Germany
KPN Mobile N.V.	Netherlands
Far EasTone Telecommunications	Taiwan
BASE N.V./S.A.	Belgium
Bouygues Telecom S.A.	France
Telefónica Moviles España	Spain
Wind Telecomunicazioni SpA	Italy
COSMOTE Mobile Telecommunications S.A.	Greece
Telestra Corporation Limited	Australia
Cellcom	Israel
mmO2	U.K., Ireland, Germany
Mobile TeleSystems OJSC	Russia, CIS countries

Source: "NTT DoCoMo and MTS Form Strategic Partnership for i-mode in Russia and other CIS countries," DoCoMo press release, December 17, 2004.

Table 9: NTT DoCoMo and its strategic partnerships

Already in 2001 Dutch operator KPN introduced the first colour handsets in Europe when launching i-mode together with DoCoMo. However, by 2007 i-mode had only attracted some 8 million users (compared to 30 million users in Japan) among its overseas partners and it started to fade away as platform outside Japan. O2 in the UK experienced problems procuring enough i-mode handsets, as major handset makers Nokia and Sony Ericsson were reluctant to support i-mode. An O2 representative in the UK stated that the world is moving from a 'walled garden' approach to an open Internet experience and considered i-mode a transitional technology (O'Brien 2007). The other large operators in the UK Vodafone, T-Mobile, and Orange had their own portals and did not launch i-mode in the first place. I-mode could be seen as a radical platform innovation in Europe as it did not contribute to the growth of the existing technological system (Hughes 1987), which was financially supported by other large entities such as operators and handset manufacturers. A reason for reluctance among non-Japanese handset makers to support i-mode was the fact that DoCoMo wanted to stay in control of technical specifications.

Growth/competition/consolidation

The last stage in Hughes' phases to describe evolving technology systems is what he calls "Growth, competition, and consolidation". The platform core that had been established in the innovation and transfer phases increasingly dealt with standard Internet content formats. However, non-technical customers (such as traditional media and advertisements firms) were increasingly asking for end-to-end solutions 2005 onwards. Delivery platform providers had modularized the core into at least the following activities: device adaption, delivery, and billing. This stabilisation of a few core components enabled them to focus on process innovations and the identification of new products and product combinations (Miles 2005). However, a high degree of non-stable platform complements, such as incomplete service contracts (Bowles 2004) and constant tailoring with system integration had to be added as complements to the platform core before customers were satisfied. The delivery platform technology systems therefore consisted of multiple sets of interdependent interfaces to the larger systems of the mobile Internet and media industries. Even as the platform core had been increasingly standardized, no dominant product designs had emerged. In other words, network effects were still held back by a fractioned platform market (Economides 1996).

Cash rich IT companies spotted this opportunity of consolidating the delivery platform market. To dominate a potentially lucrative bottle neck for the growing mobile contents industry they they started acquiring struggling service delivery platform firms. These smaller innovative firms often lacked the resources and scale to create integrated delivery solutions for large media conglomerates and carriers by themselves. The boundaries of firms were in continuous flux as momentum was high in the industry with an ever increasing load factor due to the growth of the industry. In this changing environment many service delivery providers came to the conclusion they lacked necessary business and distribution skills themselves . In order to develop dynamic capabilities (Teece & G Pisano 1994) they hired people from the media industry in order to address processes and their own market position. The industry lacked commonly agreed standards for how delivery platforms should operate leading to many firms seeing management and integration (merger and acquisition) rather than technology markets (licensing technology), constituted the most efficient coordinating mechanism across these interdependent interfaces (Christensen et al., 2002). This is one of the reasons for a high number of mergers and acquisitions involving SDP suppliers from 2005 and onwards in Europe.

Financial strength became a prerequisite for bidding on projects for two reasons: Carrier and retail brands increasingly wanted long-term suppliers, and all partners bidding in the same project were only as strong as the weakest link. US software and IT firms increasingly utilized their profits from the desktop markets 2005 onwards to acquire European firms in the mobile delivery space. The momentum of innovation shifted from Europe to North America with firms like Research in Motion, Apple and Google eventually dominating the smartphone and service market. The break-down of platforms into modules eventually enabled reengineering and innovation of new industry platforms by Google and Apple.

Convergence and two-sided markets: Softbank and Vodafone

In this section we start to unravel *"how do technologies and firms interact?".* In order to explain how platforms create two-sided markets in the telecom industry. We can see the role of service delivery platforms as mediating convergence on the four levels as previously mentioned:

- Industry level: Common technical interfaces between fixed and mobile service delivery platforms were developed; Advertisements and marketing firms produced campaigns for TV, the desktop Internet, and the mobile Internet
- Firm level: Organisational boundaries in the delivery chain
- Product level: Boundaries between product markets (e.g. market of mobile music downloads and digital event tickets
- Technology level: Interfaces between mobile delivery components

Converging products and technologies enable firms to develop new revenue architectures – what we defined as business models in the previous chapter.

Softbank: from broadband to mobile

Softbank started out as a broadband and Internet service provider in 2001, but in 2006 also offered mobile services when they acquired Vodafone Japan's network. It is common for telecom firms to offer one bill for multiple access to mobile phone, fixed phone, and broadband access. In some cases access to TV is also included. We define this as product convergence. Lead users of telecom products might also explore aspects of technology convergence, such as making calls

from their mobile phone routed over their home broadband network instead of the mobile network.

Early mover in a deregulated broadband market:

Softbank is a majority owner of Yahoo Japan (Softbank 2011) that offers various types of Internet services. Since Softbank acquired Vodafone Japan in 2006 the focus of Softbank shifted to become a fully converged operator in Japan (offering telephony, mobile services, broadband, and TV). "BBphone", its voice over Internet service (VoIP) features cheap international calls and free fixed calls between BBphone users in Japan. Softbank challenged the incumbent and gained the largest broadband market share already in 2002. It took the Japanese market by storm and the market reached a "tipping point" when most households decided to get broadband in 2003-2004. By initially launching broadband services under the Yahoo brand, a strong connection to content was early on established.

Two-sided markets:

We can summarise Softbank's multi-sided market platforms as follows:

Buyers	**Platform**	**Sellers**
Users (fees)	Mobile phone portal	Content providers
Users (fees or free)	BBPhone (landline)	Telecom companies
"eyeballs"	Yahoo Internet portal	Advertisers
Users (fees)	Broadband TV	Broadcasting firms (channel access)

Table 10: Softbank's two-sided markets

We can further do a top-level analysis of Softbank's two-sided markets where we can analyse the network effects depending on Softbank's market position (Evans 2003):

Buyer/Seller market power and elasticity:

- Mobile portals would usually operate on a revenue share basis with a relatively strong position for Softbank Mobile as they are one of three platforms, even if it constitutes the weaker among its competitors (compared to DoCoMo and KDDI). Users rarely multi-home and are bound to long contracts leaving them with a weak bargaining position.

- Telecom companies would usually be regulated on termination fees for landline and mobile calls, serving more the purpose of decreasing "churn" for Softbank than generating profits. Due to regulation competitive network effects are not in play.
- Advertisers on the Internet portal have a weak position as they offer a "nuisance" to buyers the platform can charge them for. Yahoo is the most popular ISP in Japan giving advertisers a particularly weak bargaining position. Lead users are crucial to the success of the platform and would not pay for access to any news but premium stock quotes etc.
- Successful broadcasters could enjoy significant market power due to scarcity of popular programmes where the platform would have to pay. In cases of advertisements-based channels, the platform might get the channel for free, the number of subscribers affecting this negotiation greatly.

Multi-sided revenue architectures and subsidies

Softbank's strategy has been to cross-sell its capabilities while expanding its user base in Japan. Softbank 2008 acquired mobile customers by having the lowest prices in the markets in order to reach critical mass. From having been mainly a broadband operator in 2005, almost two-thirds of its turn-over originated from mobile operations in 2008 (Softbank 2008).

Most new mobile data subscribers signed up for flat rates (unlimited usage). Ericsson in Japan (Interview, May, 2007) claimed that 3G users consumed 8 times as much data as 2.5G users; and 3G flat rate data users consume data in excess of ten times as much as 3G non-flat rate users. As mobile data usage increased, Softbank eventually shifted back the data pricing model to volume-based pricing again to reflect increased infrastructure (platform) investments.

The "New Super Bonus" plan offered mobile subscribers the option of purchasing their handset while receiving a fixed discount on their monthly bill (rather than getting the handset subsidized completely by the platform which is the common practice). Almost 90% of new Softbank users used this option in the end of 2007[16]. Due to near-zero interest rates on savings for consumers in Japan, Softbank can borrow capital cheaply from mobile users in order to subsidize users on other platforms, such as TV users.

[16] Interview, UBS, Mr Makio Inui, Oct 2007

Softbank's strong position in the broadband market convinces its customers to also get a mobile phone subscription with them. In this sense subsidising broadband customers with cash from the "New Super Bonus" plan made sense as broadband customers traditionally have a lower churn rate than mobile customers.

Vodafone: from mobile to broadband

Vodafone is one of the largest telecom operators in the world established already 1982 in the UK. It is operating under its own brand in some 20 markets including Italy, Germany, and India.

Early 3G mover focusing on mobile services

In 2000-2002 Vodafone rushed to secure a first-mover advantage strategy in rolling out 3G. In 2001 Vodafone acquired J-Phone, the third largest network in Japan and rebranded it 2003 into its own global portal "Vodafone Live. Apart from 340 million mobile telecom customers (2011) it also had 5.6 million broadband customers Q1 2010. In 2009/10 it was estimated that around a quarter of Vodafone's revenues came from the DSL business – mainly from reselling DSL capacity[17] (similar to Softbank's broadband share of total revenues). Vodafone sold its Japanese network to Softbank in March 2006. Its CEO Arun Sarin commented in January 2008 on the change of Vodafone's strategy (Randall 2008):

> "…I think all of 2006 was about telling the world that the world around us had changed, that having a strategy that was mobile only, that was OECD focused, is not the right way to go, that we needed emerging markets, we needed to be in the broadband and Internet business…"

In 2007 Vodafone launched a partnership in the UK for broadband services by reselling BT's wholesale DSL service. In 2006 it started acquiring European broadband providers and transformed itself from a "mobile-only company" into Europe's second largest broadband ISP[18].

[17] Orange presentation (2008)

[18] Orange presentation (2008)

Two-sided markets:

We can summarise Vodafone's multi-sided market platforms in the UK as follows:

Buyers	Platform	Sellers
Users (fees)	Mobile phone portal	Content providers
Users (fees)	Broadband wholesale	Broadband providers

Table 11: Vodafone's two-sided markets

We can further do a top-level analysis of Vodafone's two-sided markets where we can analyse the network effects depending on its market position (Evans 2003):

Buyer/Seller market power and elasticity:

- As for Softbank the mobile portal (Vodafone Live) operates on a revenue share basis, even if it has had several exclusive content deals in the past. Users rarely multi-home and are bound to long contracts leaving them with a weak bargaining position.
- Broadband customers are offered a "package deal" if they sign up for a mobile subscription. The introduction of mobile broadband has increased the ability for multi-homing, but that is also a focus area for Vodafone mitigating that risk.

Multi-sided revenue architectures and subsidies

Vodafone realised it had few commonalities between its Japanese network and other markets, making it difficult to utilise its global assets, such as its portal Vodafone Live. Another difficulty Vodafone had in Japan was the lack of broadband assets to respond to consumers who looked for bundles of broadband and mobile access.

Vodafone instead consolidated its converged products in Europe while launching mobile data service in the UK in 2007. This shifted its focus from being a mobile portal provider into also being multiple access provider of mobile, broadband, and land-line access. In the UK market Vodafone used broadband partners to retain mobile customers rather than competing with other broadband providers.

Part III:

The cases - A time series of mobile service innovation

1999-2005: Portals and fees

This chapter focus on how network operators launched portals at the dawn of the mobile Internet in 1999 and onwards. Such portals enabled the first business models and the best way to map two-sided markets before convergence made the markets increasingly complex and advertisements-based revenue and other application stores took over. This chapter mainly covers developments between 1999 and 2005, as operator-controlled portals gradually lost their role as control points, especially in Europe, including the UK. In this first chapter we map our concepts from previous chapters onto the market situation from 1999 up to 2005 and beyond when this is necessary to explain major developments. This chapter forms the basis for further value network and platform innovation analysis in the coming two chapters, and start to address the six complementary research questions we listed at the end of the methodological chapter. As business model we note that operator-controlled portals are the primary example of fees as the main payment for services, whereas in the coming two chapters we will also explore advertisement and user data as payment for services.

Introduction

America Online (AOL) created a so-called "walled garden" in the 1990s where users of its service could only send emails to other AOL customers. In this way the platform owner AOL restricted customers on other platforms access to its services and used various measures to keep its users within its own walled garden (Hu 2000). Telecom companies tried to replicate this idea of walled gardens with portals for mobile content.

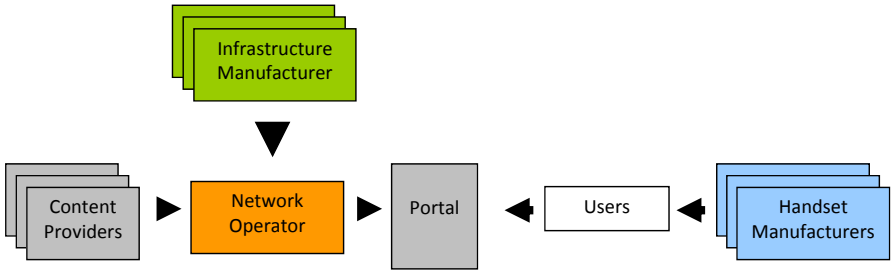
Japanese operators pursued closed standards for their portals (walled gardens), but chose the open standard of email for messaging. European operators on the other hand pursued an open standard for their portals (WAP), but used the mobile phone-specific short messaging system (SMS) for messaging. European operators experienced mixed success with its own walled garden approaches, but had miniscule revenues on their portals compared to its Japanese counterparts 1999-2005.

SMS held very high profit margins for European operators, assisting their international expansion. In Europe's case, some operators went as far in their attempt to control and integrate the value

chain of contents as to experiment with their own content production. Japanese operators instead focused on collaboration with handset makers to specify standards for content presentation, and restricted their activity to billing, running and marketing their respective portal. Differences could be used to analyse how technology and business strategies among focal players contributed to various degrees of success in emerging technology markets for services mediated by platforms.

Multi-sided markets: Users and firms

For most media firms, especially advertising firms, the mobile phone has come to represent yet another channel to access customers, sometimes referred to as the "fourth screen" (the others being TV, PC, cinema). Delivery technologies often get developed for specific applications, but the convergent nature of the media industry, such as in film launches could turn delivery platforms into technology systems. The various types of companies involved in delivering mobile Internet services via a portal can be likened with a system or network of interdependent linkages, as explained in previous chapter.



For our description in this chapter we focus on:

- network operators
- content aggregators
- retail brands, and
- service delivery platform providers

Funk (2004) points out the mobile Internet acted as a disruptive technology for existing and advanced Internet applications (business usage), whereas entertainment content (consumers)

were much easier to enable and sell. Any producer of consumer goods has two generic choices: To start their own shop and distribute directly to users in the open market (with their own shop, or site in the case of Internet contents), or compete for shelf space in a well-known distributor's shop (a portal in the Internet case). In the latter case direct marketing and distribution costs can be cut, but margins are typically lower. The Japanese market set out as a coordinated wholesale market with the three main operators offering one portal each, whereas Europe was more alike a direct sales market.

The "i-mode" service operated over a packet-switched network from its launch in February 1999 and became the first market in which mobile phones operated on packet-switched networks. Takeshi Natsuno, one of the chief architects behind i-mode early on explained how he saw an incremental approach towards developing the mobile Internet as important (Kitada & Scuka 2001). Vodafone launched its portal "Vodafone Live!" in 2003 after having modelled it on the "J-Sky" portal it took over from J-Phone in Japan.

There were many common denominators between the Japanese and UK market: Both markets were pioneering the mobile Internet and had mark-up technologies in place (Wireless Application Protocol called WAP in Europe and compact-HTML in Japan); WAP was adopted by KDDI the second carrier in Japan (DoCoMo used c-HTML); handsets had black and white screens and no ring tones or java games in both markets at launch in 1999. Messaging had also taken off and become the "killer application" in both markets already back in the mid-90s as the first "data" application in both markets.

A manager who used to work for Sony with insights into both Japan and the UK market says the following about early differences between getting the film studios on the mobile service bandwagon in Europe and Japan[19]:

> "In Europe the studios underestimated the complexity of the mobile experience. In Japan, dedicated mobile service providers acted as middlemen to adapt movie content to the mobile screen. In Europe, most studios waited with introducing mobile services and then

[19] Interview, David Lipp, Shozu, 9 July 2008

did most of it themselves… As the studios aim for the best possible experience; they were also unconvinced at first if mobile could deliver without diluting their brand."

Early Japanese success: Getting brands on-board

The IT bubble did not reach and establish itself in the same way in Japan as elsewhere in the Western markets. In Japan leading firms instead focused on the belief that the content distribution process for mobile services was no different to other industries: Strong brand names dominate and take use of new distribution channels, with a flavour of the power of innovativeness, and building strong relations between customers and distributors. The overshadowing concern for Japanese content providers was to engage in market pull rather than pushing the market with new technology. "It is hard to do market research for content", as a senior manager in a leading consumer electronics company expressed it[20]. Initially European operators tried to create their own content (or in DoCoMo's case set up a new banking experience).

When choosing handsets in Japan you also choose an operator. In 1999 DoCoMo suffered a decreasing market share following the start of CDMAone services from DDI and IDO – later merged into KDDI. KDDI had since 1999 focused on students (with discounts) and built brand as "the youth phone". J-Phone (later Vodafone, then Softbank Mobile) focused on young girls, and DoCoMo was seen as the "business man's choice".

It became clear to operators in Japan when switching from mobile banking focus to infotainment that it was important to use well-known brands. The main winners from the widespread usage of mobile services in Japan were the carriers, who reaped profits mainly from packet charges, and not content fees. Content providers themselves were benefitting, but only a few large players made profits in the early days. One of these early success stories was Nikkei Business Press (the world's largest business daily). Between 1999 and 2003 the top tier providers in Japan kept their strong position, but the expanding content industry also gave space to several new runner ups (Cybird, Index, Dwango, G-mode and others), since the market multiplied in size. Mobile content

[20] Interview, Increment P (Pioneer), Mr Nozaki, Oct 2003

became more and more like any other product, where supply and demand, and effective distribution affected the success of a company.

The first two years after i-mode was launched new content aggregators had to produce much of their content by themselves. Many established brands did not want to risk their reputation to get involved in doubtful company before the mobile Internet had become an established media channel. By 2003 the situation changed and the new mobile content aggregators worked with retail brands to package and deliver contents[21].

Nikkei Business Press, interview in October 2003

Nikkei had between 100,000 and 200,000 subscribers depending on the day of the month and special events, such as the world cup etc. They charge 300 yen per month on i-mode. They worked with KDDI and J-Phone too. The medium user age is 40-50 years on the paper edition (3 million sold every day) and 30 years on the mobile edition. An estimated of 1-2% of total Nikkei subscription revenues come from the mobile site.
As a comparison Yomiuri, the largest newspaper, has 10 million subscribers. Households in Japan have 2 newspapers in general. There are only about 100 newspaper companies in Japan. They are regional, not local in contrary to Europe, but in return they have many subscribers. Nikkei believes therefore critical user base for mobile distribution is also easier to reach in Japan compared to more fragmented newspaper markets.

Content Evolution of Nikkei's sites 1999 to 2003

- In the last 2.5 years no change in subscriber numbers.
- Culture in Japan is that business users with a corporate mobile subscription not allowed to use i-mode, only privately they use it.

Technical Discussion

- Nikkei develops one application per handset; backward compatibility with java is challenging.
- When they do testing, usually browser-related bugs are easy to track, but different Java virtual machines on the handsets make that trouble shooting tedious sometimes.

New Services and Costs

- Video: Next spring, 40 sec. downloads are possible, but people won't pay the corresponding 100 yen for that data. It must be made cheaper and free is best.

Possibilities with 3G

- KDDI Win, EVdo network, Dec. 2003 it will be launched. 4200 yen for unlimited packets a month. CD-quality sound is no goal for mobiles, as users can buy CDs instead.
- For streaming to succeed there must be bundled packet charges, according to Nikkei. The video service M-Stage that DoCoMo had for PHS was shut down, because of high packet fees for users

[21] Interview Oda-san, Index, Oct 2003

Late awakening in Europe: from SMS to the Internet

In the UK operators in 2000 were mainly focusing on the big three handset manufacturers at the time: Nokia, Motorola, and Ericsson. As the phones were circuit switched, users had to pay for connection time rather than data transmission. SMS were priced at about twice the price as in Japan and GPRS data (only available in the US at the time) also priced at a premium compared to Japan[22] . In a European survey by mobile Internet/mopilot in 2000 on "What is stopping you from using WAP more frequently", 42% answered "price", 43% "slow connection", 33% bad content, 18% "problems with the handset". Other surveys in 2000 also showed that mobile Internet users (in Japan) were more prone to be interested in advanced services compared to SMS users in the West (Morgan Stanley 2000). Jon Sigurdson reports on the early failures of WAP and the lack of collaboration between operators and handset makers (Sigurdson 2001):

> "When reflecting on the present "failure" of WAP a Nokia manager says that marketing of WAP could have been done differently and the early consortium and the subsequent WAP Forum fatally missed the opportunity to communicate the WAP concept to operators, content providers and users, and different expectations were created that could not actually be fulfilled as realistic business models were not developed. There was also a lack of understanding that mobile Internet was different from the ordinary Internet that was rushing ahead. The mobility – in time and location – is fundamentally different from ordinary Internet and was not translated into new business models."

Sigurdson continues:

> "A top manager at Telia Mobile reflects that there existed at the time of WAP conceptualisation a wide gulf between the operators and the [handset] makers. This gave him and others the impression that the makers of handsets were interested to develop a proprietary standard that would cover parts of the interface protocol. He says that there is a little doubt that the future development and introduction of WAP would have benefited from an active participation of the operators and their subscribers. He also

[22] 0.073$ on one-to-one's network in the UK against 0.037$ for DoCoMo in Japan (Morgan Stanley 2000)

ventures the opinion that the role of operators within the WAP Forum has basically been neglected."

The Japanese success of high revenue share for content providers on the portals had been noted by Western operators in 2001. It could therefore seem surprising that European operators were insisting on high revenue shares for themselves on their portals. One reason was that SMS was used to deliver content, making it difficult to charge for data separately. So operators had two choices: move to the Japanese mobile Internet model or stick to the SMS model. UK operators belonged to the more aggressive among European operators in terms of investing in mobile data services, partly driven by the new entrant Hutchison 3G.

Operator portal services

A look at the usage of i-mode sites in 2001 tells us about the importance of entertainment services as driver for usage. 64 percent out of the total number of hits on NTT DoCoMo's portal were entertainment sites. Furthermore, according to Softbank's own estimations, less than ten percent of companies with sites listed as official portal sites, had more than 100.000 users – these were the only ones considered "successful" and having black numbers. In September 2000 NTT DoCoMo had 323 application partners excluding banks (companies developing official i-mode sites that can be accessed through the DoCoMo portal). With this reasoning the approximate number of companies with a site exceeding 100.000 users could have been as low as 30. Relatively early profits were consolidated to a few companies in Japan. In Europe at the same time content consisted mainly of ringtones and graphics sold over SMS (Kärrberg & Marnung 2001). The Japanese Multimedia Content Association (MMCA) estimated roughly the mobile content market in Japan to approximately 45 billion yen already in the year 2000 (MMCA 2000). Major Japanese mobile content providers made profits, Cybird as an example in order of USD70-80 million in 2002 (Cybird 2008).

DoCoMo's revenue share was only 9% on mobile content, but packet fees was the underlying reason why DoCoMo captured 85-90% of consumer spending on i-mode in 2001. In this sense NTT DoCoMo acted as a catalyst for the content market, but made its money as a "bit-pipe" (Kärrberg & Marnung 2001).

Mobile music: New platform, same users

The music content sales got off to a head-start in both Europe and Japan. Traditional music sales were saturated or decreasing in both Japan and Europe around 2000. The Economist (2004) reports that ringtone sales were $3.5 billion worldwide in 2003, up by 40% from 2002. Sales of ringtones had already overtaken CD singles and outstripped legal Internet download services, such as Apple's iTunes, which generated less than USD 100m in 2003 worldwide reports Informa (I2008). In Europe carriers early on lost the initiative on delivering wallpaper and ringtone business to premium SMS providers, but these still had to pay high revenue share fees to the carriers. It is no secret that digitalization of music and the drop of CD sales caused turmoil in the industry. As physical sales declined, digital music sales rose 69 percent though year over year 2003-2007 (Informa Telecom 2008). The difference being of course that distribution shifted to the likes of i-tunes in Europe and also to mobile operators in Japan. In the beginning, ringing melodies were manually input by users before the development of the mobile Internet enabled distribution of ready-made melody files. New technologies made it possible to distribute parts of original songs and, ultimately, full-track music. Initially ring signal services in Japan were dominated by karaoke providers, while recording companies and content creators dominated the subsequent real-tone and full-track music download services (Takeishi & Lee 2006). In Japan markets of technology for music didn't take off for monophonic and polyphonic ringtones (1999-2003) as karaoke providers re-created original songs and marketed them mainly by themselves. But gradually, popular service providers bought the rights to songs from music companies and marketed them on their own portals. Between 1999 and 2006 consumer and entertainment contents have totally dominated over business applications in terms of sales volume in both Japan and Europe. As Funk (2004) points out, the mobile Internet acted as a disruptive technology for existing and advanced Internet applications (business usage), whereas (simple) entertainment content (consumers) were much easier to enable and sell.

An integrated analysis is needed of the business ecosystem of the mobile music in Japan to understand the interplay of copyright institutions and business models of dominant actors. Due to weaker copyright institutions in Korea, carriers could dominate the music industry (through buying major record labels e.g.), which wasn't the case in Japan and Europe. Among the music companies, Sony Music in Japan initially lost out to fast-moving karaoke companies in the ringtone business, but revived its influence and sales when full music downloads became

available[23]. The issue of IPR challenges as a result from new technology innovation is often difficult to anticipate, as when Japanese users leafing through magazines took camera pictures they found interesting, rather than buying the magazine (Mobile Communications International 2003).

In 2003 DoCoMo's FOMA still had no "killer app", apart from attractive pricing for heavy packet users. But KDDI had gradually won the trust with users as the more innovative and youthful operator. Global mobile entertainment revenues for 2007 were estimated at USD18bn. Of these were music revenues USD11bn, games USD3.2bn, followed by images for USD2.4bn. This was dwarfed by global SMS revenues of USD60bn the same year (Informa Telecom 2008).

In an interview with the second largest ringtone provider, Giga Networks, in Japan 2003 it was clear mobile music was big business. It was the second largest ringtone provider from 1999 until full track music started in earnest 2005. It is the karaoke division of "Ricoh" the office and consumer electronics giant. In 2003 Giga Network had around 5 million users on three sites on DoCoMo's i-mode paying between 100 and 300 yen each. Between 1999 and 2003 the business model was unchanged with 100-300 yen services and no one-time downloads with DoCoMo. In October 2003 at the time of the interview, it was still not clear what value 3G would add[24]. As it turned out, the karaoke companies were not able to continue rake in cash once the full-track music download business started in 2006-2007 by record companies.

Overall in 1999-2005 mobile platforms provided new and profitable ways for the music industry to make up for an overall decrease in revenues due piracy and peer-to-peer traffic on other parts of the Internet.

Music standards:

Having previously been sold in a multitude of mobile-specific polyphonic formats, handsets increasingly handled standard MP3 files 2005 onwards. It became more difficult to sell music over the air. Karaoke machine makers in Japan were first out to reap the benefits of mobile

[23] Interview, David Lipp, July 2008

[24] Interview, Managing Director Giga Networks (Ricoh), Oct 2003

ringtones. Ricoh in Japan had a wealth of MIDI ("musical instrument digital interface", a file format) materials from famous songs. Since the songs were not original, only the song writer and not the recording company get any royalty, according to rules of JASRAF (Japanese artists songs rights association).

Europe had a similar situation with large record companies missing out on the first wave of monophonic and polyphonic ringtones, due to lack of copyright protection and ambiguous IPR legislation. However, already in the second wave from 2003 onwards, record companies teamed up with mobile operators and by 2005 dominated the ringtone business by synchronizing new record releases mobile strategies.

Further developments 2005-2007:

The mobile music download business stagnated 2007-8, due to 'side-loading'. Side-loading meant that users transferred their own MP3 songs onto their devices, without downloading and paying for it[25]. Hence, the technology system of service delivery platforms was challenged by disruption when users found a parallel delivery system which was outside the control of the record industry.

Japanese operators managed to initially mitigate the side-loading as they controlled the standardization of handsets. They simply made it impossible to load external music files onto the devise. 3G bandwidth and data speeds in Japan had also developed that much more than in Europe as users could already download full-track music to their devices. In 2007 music downloading was still to 95% done via mobile phones in Japan up until 2007, while PC downloads more than doubled in 2006.

In Europe and North America Apple's success with the iPod and eventually its on-line music store 'i-tunes' was gradually taking over music distribution from 'side-loading'. Mobile operators in Europe was not on the back foot: The UK's first unlimited mobile music download service, Vodafone MusicStation, went live Nov 1st 2007 giving phone customers unlimited tunes for £1.99 a week. It was announced a week ahead of iPhone's UK launch on rival operator O2's network.

[25] David Lipp, 9 July 2008

Music applications initially launched on desktops eventually migrated to mobile platforms. "Spotify" is such an example of a streamed music service that launched on PC, mac, and then extended to mobile platforms (i-phone first, then gradually to Android and Symbian devices, and eventually Microsoft Mobile, Palm and Blackberry). It has revived the debate about network operators and if they should focus on being bit-pipes or service providers. i-tunes and iphones enabled Apple to move much of the mobile music from operator-controlled portals into Apple's own walled garden. The decline of off-line music sales was not offset by increasing on-line and mobile music sales between 1999 and 2009:

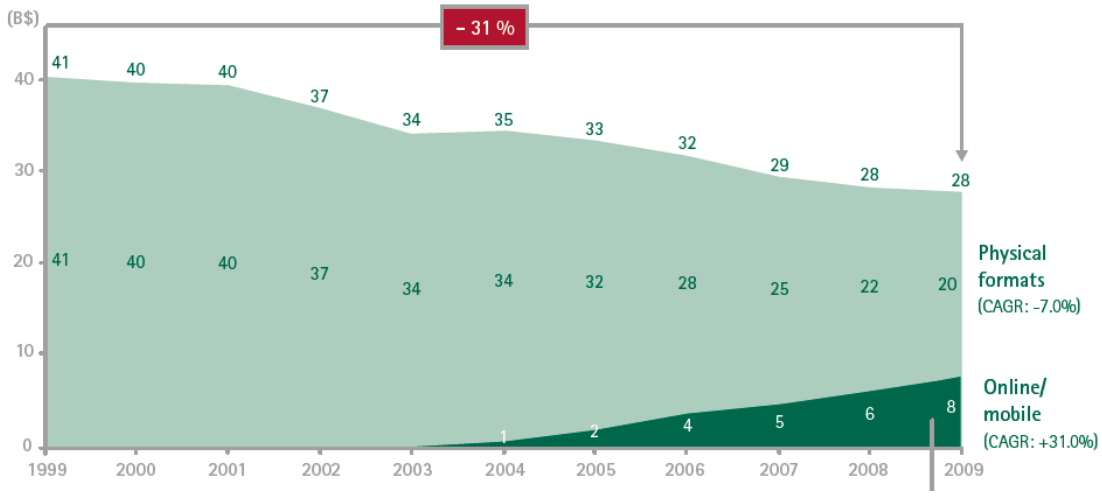


Figure 17: Recorded music revenues (global) 1999 to 2009 (BCG 2011)

Mobile gaming: New platform, new users

Gaming giants in Japan early realised the potential of the handset as the "new console". Many resources were invested early on in Japan by the production houses themselves, such as Sega, Konami, and Capcom. Europe saw another development, where lack of standardisation kept large distributors (Electronics Arts and others) from investing. Instead, mobile start-ups (Glu Mobile and Digital Chocolate to mention two) entered this space to later be acquired by large distributors. The mobile gaming industry in Europe was bogged down by lacking handset and billing capabilities until 2003-2004. Several first movers in Scandinavia[26] and in other parts of Europe were backed by venture capital and developed early

[26] Picofun, Blue Factory, and Aspiro to mention a few

versions of games trying to grab market share. However, response times and the overall user experience were some of the reasons why users did not spend much money. Established financial institutions concluded there was an over-supply of capital from new venture companies compared to the business opportunities and consumer interest (Morgan Stanley 2000).

In Japan the demand for mobile entertainment services attracted traditional game software companies from 2001 onwards when the first java phones were released. Even before the introduction of java, a few game providers (like Dwango's 'Tsuribaka' game) attracted 100s of thousands of users paying 300 yen or more per month. A general downturn for game centres in Japan at the end of the 1990s coincided with the introduction of mobile Internet services. Especially SEGA and Namco, market leaders in game centres, were already looking for new sources of revenues.

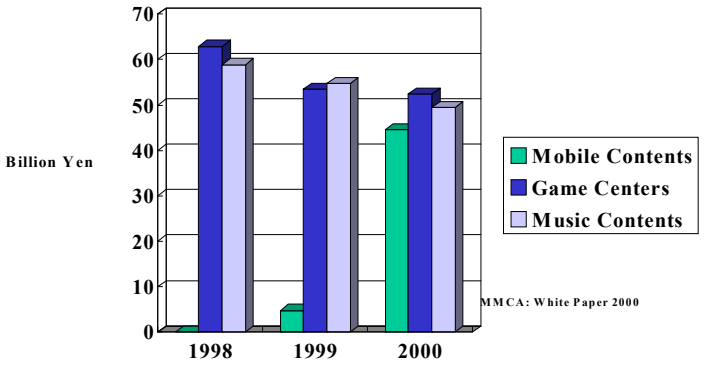


Figure 18: Japan entertainment trend 1998-2000 (MMCA 2000)

Early coordination between networks of Japanese game publishers and the telecom carriers became crucial in order to reach economies of scale. Handset specifications were shared by carriers with development partners in due time before handset releases. This enabled also coordinated marketing efforts of services, handsets, and related delivery systems. The figure below illustrates the major game software companies in Japan who got involved in mobile gaming and their main business areas in 2000:

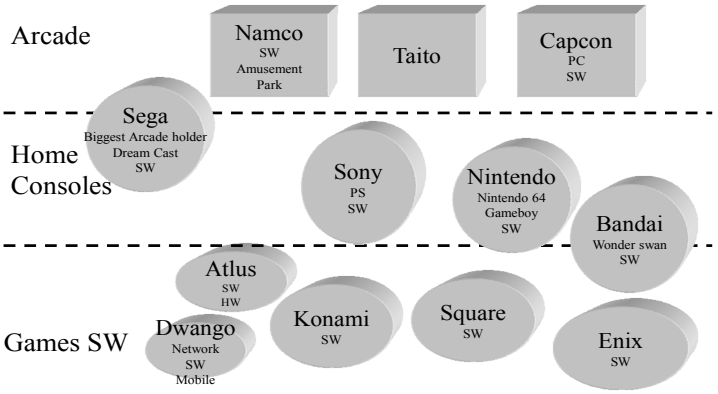


Figure 19: Overview of the Japanese gaming industry (Kärrberg & Marnung, 2001)

Also new entrants (such as firms Dwango and G-mode) got on the carrier portals in 2001 with their games, often staffed by former employees of large game publishers. All of the gaming companies entered the mobile Internet gradually from 1999 and with force in January 2001 when java handsets were released. They all saw it as crucial in order to regain sales from a declining game centre market. The mobile games market in Japan was estimated to USD230m in 2005. In Japan companies like Namco, SEGA, and Konami offered most of their popular game services in the entertainment category on NTT DoCoMo's i-mode portal.

Academics in Japan report on what they claim is a gaming cluster in Tokyo (Baba, 2001), adding to the innovative capability of companies located in the areas. Part of the gaming industry is the usage of popular "characters". The licensing industry for domestic and foreign characters is very large in Japan. As an example, licensing of one particularly popular character "Pokémon" turned over approximately 400 billion yen in 2000 which dwarfed the whole mobile gaming industry (Kärrberg & Marnung 2001). Java games were seen increasingly as drivers of revenue from carriers who actively promoted new types of games, such as role playing that demanded server contact. Games also provided the first real opportunity for Japanese content providers to export to major carriers in Europe.[27]

[27] Sega created a related diversification strategy when splitting their game developing organisation into smaller independent units, each with a certain market focus, some of them targeting the mobile segment. They had some initial challenges moving into games due to a lack of web designers, but the efforts eventually paid off. SEGA spun off many affiliates from the mother company, with names such as Sonic

Gaming standards

Before java games were launched on DoCoMo handsets in January 2001, games had small footprints, were browser based, and were dominated by horoscopes[28]. In contrary to music, piracy was not a problem which occasionally supported very high margins as several titles sold in hundreds of thousands or even millions of copies in Japan. DoCoMo offered their own version of Java called Do-Ja with a small footprint. No particular licensing or fees were associated with this platform, whereas BREW (binary runtime environment for wireless) developers on KDDI were mandated by Qualcomm to pay for getting access to the software development kits. BREW was the only competing platform to java games in Japan at this time. In Europe java games were released starting 2003 and onwards. The advantage of BREW applications compared to Java was less need for porting.

Compared to the music industry, gaming provided a new platform without much opportunity for piracy. The music industry initially lost out to ringtone providers, and just as full-track music was on offer, so-called "side-loading" became an issue in 2006-2007. Whereas mobile gaming was an all-together new opportunity (gamers had been playing either in game centres or at home before), mobile music had already existed since the walkman in the 1980s and was both an opportunity and threat to established revenue models. Successful games continue to be a lucrative business. In Apple's portal "Appstore" games was the largest category among applications 2010-2011 (Meeker 2010).

Further developments 2005-2007: Addressing the cost of fragmented platforms

In 2007 it was estimated that three countries accounted for almost half of the worldwide revenue from mobile gaming: Japan, the US, and South Korea. They contributed USD1.5 billion out of a total of USD3.2 billion worldwide. Hence, gaming had a turn-over twice of mobile TV and

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Team (Java applications), Hitmakers (mobile content), Amusement Vision, SEGA Rosso, and United Game Artists. A control group in SEGA then sent request for quotations to these affiliated companies about game titles. To give the respective managers more influence over these affiliates they offer incentives in the form of stock options etc. SEGA had around 1000 people working with digital contents in the end of 2000. (Kärrberg & Marnung 2001).

[28] The gradually increased download sizes of java applications enabled more advanced "shoot-up" games, compared to initial 80s classics such as Pacman and Space Invader.

video, but only corresponded to one third of total mobile music revenues (Informa Telecom 2008).

Investments to develop a new java application were rather high, in the range of USD25k-50k for an initial prototype working on 3-5 handset families (both in Japan and Europe). When i-phone and Android were launched 2007 onwards they did not only address an increasingly advanced game market (with motion sensors and touch screens) but also the fragmentation issue. Especially i-phone addressed fragmentation as the so-called "apps" only have to be adapted to the number of iPhone releases (5 at the end of 2011). Porting costs for apps are therefore a fraction of the java games. A Japanese firm operating in Europe explained the challenge in 2005 of uploading 75 or more java-related files into their service delivery system every time a new game was launched for in one market for a European operator[29]. Games therefore become very expensive not only because of licenses and development, but primarily because of the high cost of distribution. The high cost of developing new applications kept smaller providers from launching and a consolidation of providers took place in Europe. Bain & Co estimated in 2009 such fragmentation made up 90% of development cost for games.

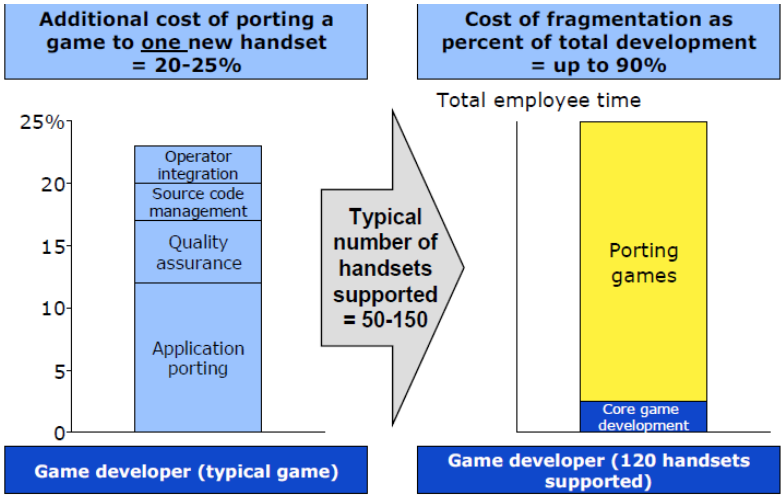


Figure 20: Porting costs for mobile games (Bain & Company 2009)

[29] Section on games development costs derived from interview with Mr Onuma , Ubit (2007)

Access to games changed drastically between 2007 and 2008 in the UK when carrier portals dropped from the number one access point to users to fall behind major Internet service providers, such as Google, BBC, Nokia, Facebook, and even Wikipedia:

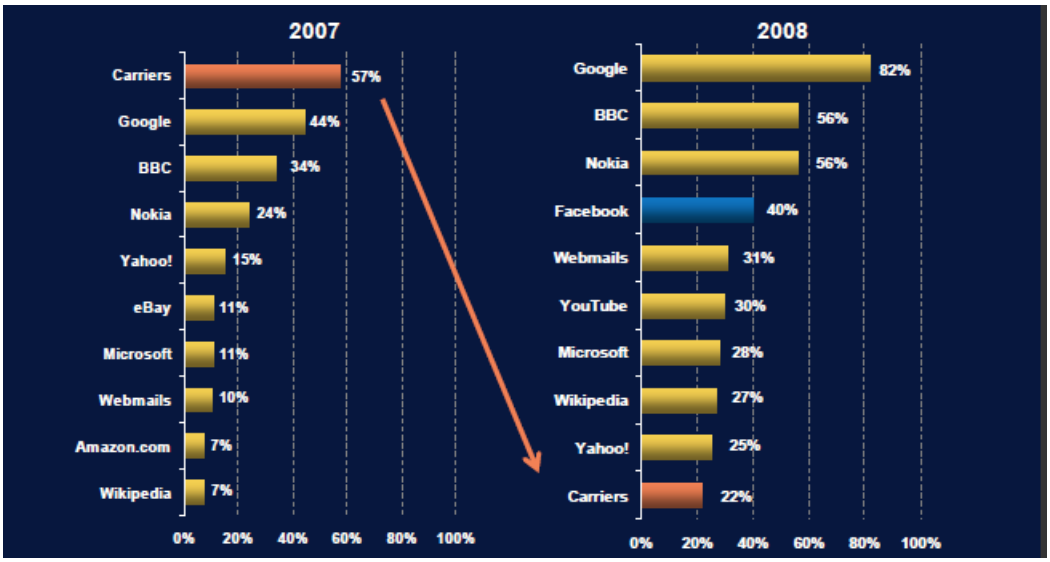


Figure 21: Mobile web sites's share of UK mobile Internet users (Source: Nokia Siemens in Morgan Stanley, Meeker 2010)

Service delivery platforms

As operator-controlled portals focus on extracting fees from users, we will in this section take a closer look first at billing and then expand our investigation of underlying technologies from part II on service delivery platforms. Micro payments in mobile services remained more or less proprietary, unique to each carrier, until credit cards in application stores emerged 2007-2008.

As mentioned in previous chapter, for products in which there is little or no value to the first users due to the existence of strong direct (for example, telephone) or indirect (complementary products) network effects face a significant start-up problem (Economides, 1996). According to Funk (2006) the Japanese entertainment content supported by a micro-payment system and custom phones displaying content in a consistent manner solved these start-up problems in Japan.

From value chain to value network

To create a distribution structure is a business negotiation, where the strength of actors in their respective networks decide what negotiation position every actor possess. In operator billing mobile payments in Japan and the UK for mobile data services are triggered via end user action and terminated in the billing systems of the carriers. The carrier billing systems either accept SMS or some form of browser mediated billing (strings of unique URLs). In 1999 and onwards disproportionate resources from venture capitalists poured in. It was invested in technology and marketing towards carriers to break their "not invented here" attitude towards outsourcing of key components in the delivery architecture. Many carriers started using such third party technology in their delivery systems and took the first step towards markets of technology for service delivery platforms. Eventually internal platforms gave way to supply chain platforms as outlined in the previous chapter.

To some extent service delivery platforms emerging as system products in 2002-2005 and were a disruptive technology to most content aggregators and even to carriers who had developed their own proprietary service delivery mechanisms. Many carriers in the EU (Japanese carriers only share their billing API) chose to procure new service delivery platforms, or at least provide open APIs to their SMS and a few to WAP billing systems to trusted partners between 2003 and 2007. Most retail brands (including game makers) by 2003 had not yet ventured into mobile service delivery, so service delivery platforms (SDPs) were not a disruptive technology to them.

Carrier portals were marginally important for SMS services from the beginning in Europe (that had gone off-portal early) and service delivery platforms were more important instead for cost effective mobile Internet sites in the growing competition among carriers, retail brands and content providers. Several carriers outsourced portal management and focused solely on wholesale of data and SMS. Carriers and brands were already with the launch of 3G networks increasingly concerned with commercial aspects of content editing and retailing rather than the basic functionality of handset rendering and content management[30]. As delivery platforms increasingly were made up of components offered by various providers, delivery took place in a network environment.

[30] Own experience at Ubit, 2005

Interfaces offered by billing aggregators

Service providers could either be directly connected to an operator themselves or use a billing aggregator. The keep constantly up to date with carrier billing updates calls for high technical expertise, but also provides higher margins when cutting out middle-hands. Connecting to a carrier through one of the billing aggregators would mean a higher unit cost, and doing it in-house lower variable and higher fixed costs. The mobile contents enabling business had quickly become a volumes game. A smaller set of service delivery platforms chose to connect directly to carriers, which also limited them to certain markets due to lower speed in entering new markets.

Interfaces for billing have gone through a standardization phase among billing aggregators in Europe. Different types of interfaces emerged. One of them, Ericsson IPX, offered the following types of interfaces: Java, web services (xml), or CGI scripting. Depending on the preference among the engineers service providers would choose to port into the billing aggregator's platform in any of these ways.

Once connected to the billing aggregator, very little upgrade work would be needed when connecting to a new operator or market, as the billing aggregator would do the work while keep the same interface to the platform of service providers. The fact that interfaces for billing eventually stabilized enabled also smaller firms to develop applications and service rapidly and compete with larger firms.

Several carriers in Europe even outsourced portal management and focused solely on wholesale of data and SMS. To some extent service delivery platforms emerging as system products in 2002-2005 was a disruptive technology to most content aggregators and even carriers who had developed early proprietary service delivery mechanisms. Many carriers in Europe, including the UK (Japanese carriers only share their billing API) chose to procure new service delivery platforms, or at least provide open APIs to their SMS (most) and WAP (fewer) billing systems to trusted partners between 2003 and 2005. Most retail brands (including game makers) had still not ventured into mobile delivery by 2003, so commercialized platforms were not a disruptive technology as such to them. Carriers and brands launching mobile services were from 2005 and onwards increasingly concerned with commercial aspects of content editing and retailing rather than the basic functionality of handset rendering and content management (Taylor 2005).

Customer business benefits rather than technology have become selling points and the main source for coordination costs for the SDP providers.

Technical components

Mobile service delivery technologies became the glue between previously secluded "telecom" and "IT" domains. Such delivery technologies became strategic product for leading IT systems providers to offer wholly or partly integrated mobile delivery offerings (Oracle, Amdocs, Microsoft, Ericsson, Matsushita/Panasonic)[31]. Behind the scene content providers bid for popular key words (such as “game”, “girl”, “gambling”) in weekly auctions (arranged by the search engine provider) in order to be on top of the resulting list that the end-user sees upon his key word search.

In Japan, pricing of mobile games used to be offered only as monthly subscription for a single game or a game pack initially, but later on also as one-off charge. In Europe the opposite development with initially only pay per download existed.

From 2005 and on, search engines (mainly provided by Overture and Motionbridge) were common among carriers in Europe. Content providers bid for key words (in on-line auctions) used by these search engines, generating revenue streams for operators both from service providers and end-users. Technical glitches and high bids from inexperienced service caused trouble for smaller content providers initially[32]. It can be argued that increased complexity in positioning ones content high on the portals disadvantaged smaller providers with fewer resources. Eventually, search advertisements were taken over by Internet services providers like Google or Yahoo. Smaller and focused mobile search firms were gradually acquired. Overture mentioned above was acquired by Yahoo already in 2003 (Olsen & Kane 2003) and French Motionbridge in 2006 by Microsoft. Virtual currencies were also used; a subscription of 300 yen could give the user 100 “points” that could be used for upgrades for games, especially in role playing games. Loyalty points would also be given to returning customers. Billing systems kept profiles of loyalty points and enabled purchases within sites utilizing these virtual currencies.

[31] Own interviews, Mobile World Congress (2007, 2008)

[32] Interview, A1 New Media, 2006

Many content providers in Japan chose to develop initially only for the largest carrier DoCoMo. Each carrier (DoCoMo, KDDI, J-Phone) had their own content specifications, billing interfaces, and had to be customized for each device, which was also different between the phone makers. Not only did technical standards differ between operators, but so did user preferences. Rather than trying to work with such a diverse platform market, many content providers wanted to be a top player on the dominating platform DoCoMo[33]. Second tier platforms could benefit from first tier platforms as green houses.

The technology components used in service delivery platforms could be further developed from previous chapter (Kärrberg & Liebenau 2006):

- **Ingestion:** Analogue and digital contents converted into suitable digital format
- **Compression:** Digital raw contents need to be trans-coded into all needed formats fitting the numerous handsets
- **Content management system:** When compressed into the right formats, contents are stored in a content management system.
- **Meta data capture:** Content is wrapped in descriptive data, such as “title”, “file name”, “author” etc, that is needed when displaying and managing it correctly.
- **Device discovery:** From the user agent, the SDP can identify the handset.
- **On-the-fly trans-coding:** For images, an on-the-fly trans-coding can be done from one raw file into the format fitting a certain user profile.
- **DRM:** Before being delivered contents are wrapped in metadata deciding what rights the user has (e.g. forward-lock). Depending on handset capabilities, this should be acted upon by the SDP.
- **Download manager:** It is necessarily to handle unstable connections, communication between java clients and the SDP, and the actual download mechanism that varies.
- **Media player:** To deliver streaming, MMS contents and other special formats to the handset.

[33] Giga Networks, Oct 2003

- **Billing mediation:** To check if the user has money to spend, and log his purchases with the carrier who provides the monthly statement/subtracts from prepaid user accounts.
- **Site builder:** To avoid coding in multiple mark-up languages, or simply drag-and-drop design systems. Site-builders automate this process.
- **Search engine:** When new content is added, it is being registered in the search engine, content providers can bid for key words, and users easily find what they look for
- **Third party management:** Carriers and MVNOs (Mobile Virtual Network Operators) with tens of suppliers can automate the sign-up process of suppliers, enforcement of SLAs (Service Level Agreements) for bandwidth usage among others.

When mapping these technologies onto the service delivery activities from previous chapter we get a technical and functional model of the delivery platform:

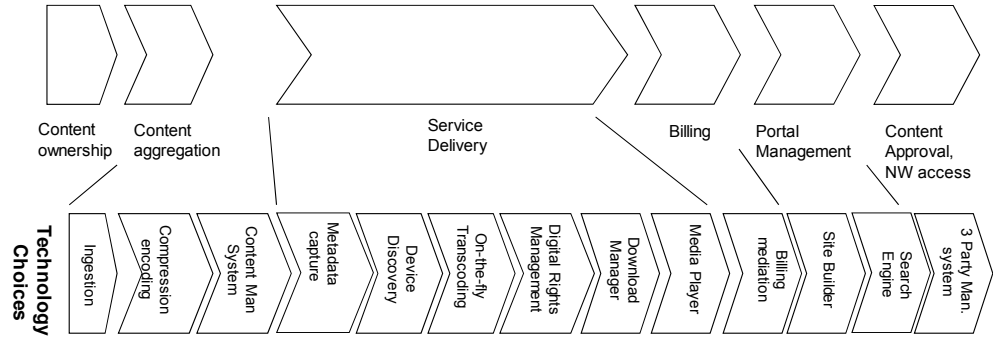


Figure 22: Detailed model of mobile delivery platform

In Japan NTT DoCoMo broke new ground already in 1999 by overcoming the coordination challenge in the delivery chain pictured above: By doing it themselves with a compelling business model and technological lead, the telecoms industry in Japan came to accept the i-mode approach, and much potential coordination cost in the value chain among the other actors was saved in the process. On the contrary DoCoMo's international expansion from 2001 onwards, such as the partnerships created with e.g. KPN in Europe seemed to lack the degree of value chain integration and coordination with i-mode's architecture that was originally the case in Japan.

When comparing Europe and Japan the first major difference was the usage of GSM versus PDC as the network standard. At a first look, it would seem as the Europe had a head-start as GSM is a global standard and PDC is not. A comparison of the degree of value chain integration among DoCoMo and WAP providers reveal big differences. WAP providers relied on the WAP protocol. However, WAP was only one of much interdependence in the new content delivery architecture. The software in a content enabled phone was radically different to that of a traditional voice phone. For WAP phones, not only was the software different, but also the need to coordinate that functionality with the needs of portals, content providers, and payment systems. Difficulties were in part a result of incompatibility between WAP servers, WAP browsers, service design, and underlying networks. In Europe no single player brought together its own value chain, circumventing the problem of a lack of standards. By relying on market mechanisms, WAP-dependent service providers had a technology that simply could not deliver the level of functionality consumers wanted.

Pricing and business models for portals

In 2000 many European content providers came to Japan and returned to Europe talking about how Japanese carriers only take 9 percent of revenues and why European carriers were so greedy in taking up to 50% of revenues. This was a misunderstanding since in DoCoMo's case they got an estimated 85%-90% of all revenues spent by consumers on the mobile Internet (P Kärrberg & Marnung 2001). From an initial domination of messaging in Japan where e-mail dominated the data traffic, it eventually changed to more Internet surfing. As data traffic was initially priced in relation to data-light emails, Japanese operators were challenged as how to price data when usage and Internet surfing increased. In 2001 it was estimated by DoCoMo that traffic was divided on a 85/15% share for web access/mail. This trend was even stronger among 3G (FOMA) users where the share was 90/10. In 2007 it was estimated that 97% of the traffic consisted of web access and 3% consisted of email[34]. The model of using email as model for charging for data was not viable anymore. In Europe the dilemma was even greater as SMS was charged at a very high price compared to email in Japan. As late as 2008 the content provider community in Europe was dissatisfied with high data prices echoing Japanese content providers in 2003[35]:

[34] Interview, Ericsson, May, 2007

[35] Interview, Peter Arvai, Juli 2008

"It is crucial with data bundles. The fact that iPhone was launched with unlimited data is fantastic. Without lower data prices the mobile Internet will not take off in Europe"

In order to understand the flow of payments better, a figure of the value network is pictured below:

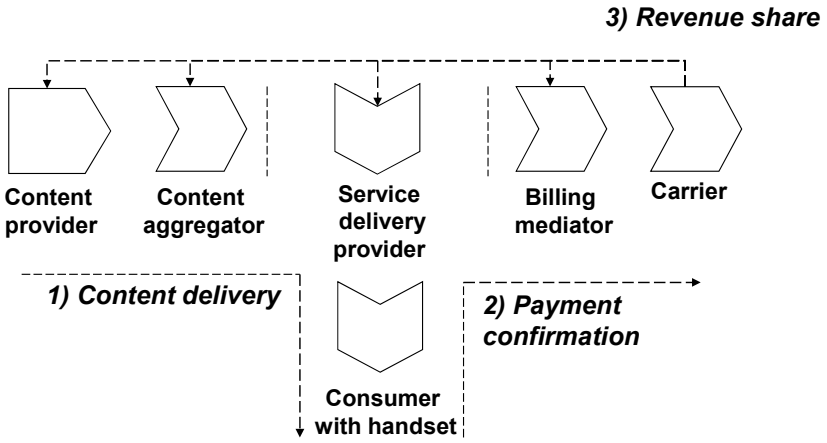


Figure 23: Mobile payment value network

A company can take more than one role in above chart. In most cases two types of billing systems connecting either carriers with billing mediators or service delivery providers with billing mediators. In some cases the billing mediator is the carrier (Japan) or the service provider themselves. There are three exchange flows of interest to our analysis of these firms: digital content delivery, monetary transactions, and business interaction between staff to enable the previous two.

After Vodafone took over J-Phones network in Japan they offered billing services for services outside their portal in order to play catch-up with DoCoMo and KDDI (but soon withdrew the service again after regulatory challenges). The "walled garden" approach for portals creates an effective entry barrier for new providers. New or smaller providers have to sell or license new projects to established aggregators like initially successful providers Cybird or Index in Japan. These content providers became gateways for other providers. From the viewpoint of the operator this induces a long-term positioning strategy among new entrants and (hopefully) a

quality control of new content by the by the carrier is enabled. The fact that leading providers such as Dwango and Index tripled their in 2003 compared to 2002 (and posted healthy profits), meant the market was growing, but it was also volume market where profits were concentrated to large content providers. Some content providers 2006 in Japan like were still posting strong profits (in Cybird's case profits in the order of $50m; Cybird 2008).

In Japan, the established game producers chose to produce mobile versions by themselves, cutting out costs in distribution. Old platform games dominated the market and most users were teenagers or in their twenties. Even if it was possible to make games connecting to the Internet (role playing games e.g.), data fees were still too high in 2003 for game firms to focus on it. Creation of game ideas and outsourcing of the actual programming are usual among established gaming producers. Games were easy to showcase with TV ads and the competition to stay on top of the i-mode portal stiffened gradually. TV commercials were a way to increase impulse purchases of games. On the i-mode portal most games were sold as subscription bundles ("game packs") including up to 30 games those users could easily download and store on their phones. User interfaces were still a reverse salient in 2003 due to limited processor power on the devices[36].

Compared to European carriers (who wanted to control the whole value chain of content) Japanese carriers continuously probed their users, and sharing the resulting feed-back to content providers. This flexibility is important for all service-layer platforms. An important part of the success compared to initial failure in Europe was also higher content kick-backs to the content provider side of the market.

Japan in 2000 was dominated by 10-20 large content providers and retail brands working directly with the carriers. These included Bandai, Cybird, Index, Giga Networks, and SEGA. The original content providers from 1999 that showed "loyalty" at the beginning towards DoCoMo were rewarded with special relationships and became aggregators. Other content providers often had to take considerable coordination costs for communicating with the carriers through these aggregators. Service delivery platform providers worked to some degree with retail brands. The

[36] Dwango interview, Oct 2003

carriers coordinated portal management, handset releases, and got their revenues mainly from traffic/packet fees and a much smaller share of their revenue from actual content fees (the carriers kept 9% of content fees).

Comparing findings in the UK and Japan

The EU in 2000 saw the carriers trying to do "everything" by themselves: aggregating and even creating content. The revenue share for content providers was generally less than 50%, and users paid for transmission time, not traffic, as necessary GPRS systems and related micro billing systems weren't available until 2002 in most markets. There was no clear business case for content providers, so SMS outside the carrier portal became the revenue driver once carriers opened up their billing systems to third parties.

Analysts at The Swedish Science Office in Tokyo 2001 summarised the lack of coordination in the European market compared to Japan in the following image. In Japan the telecom operator is coordinating the access to services through its portal, whereas in Europe no actor was guaranteeing the quality of service, confusing customers:

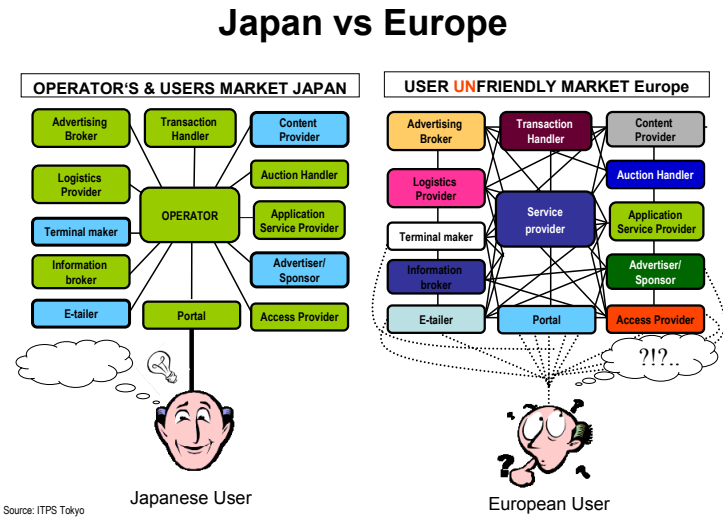


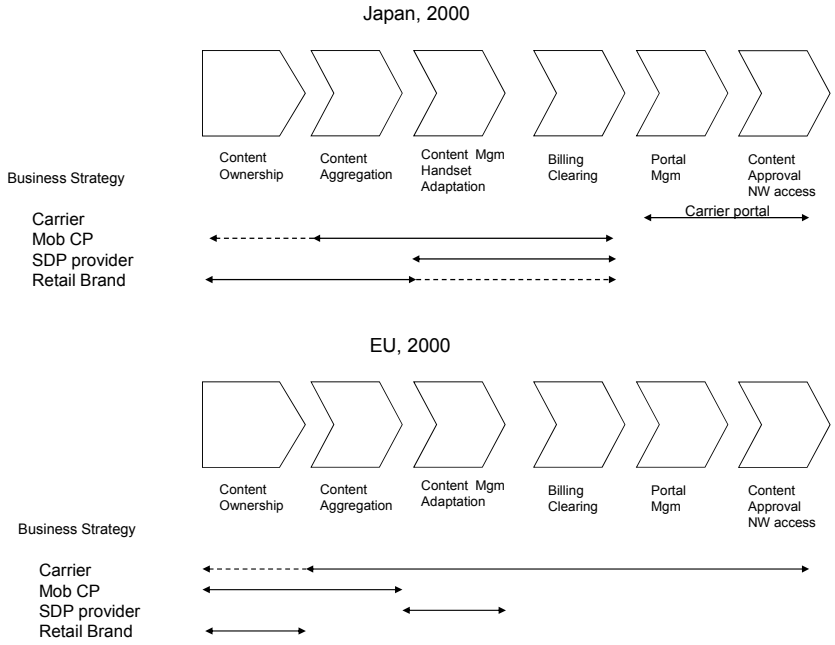
Figure 24: Japan and Europe's early mobile service markets (ITPS 2001)

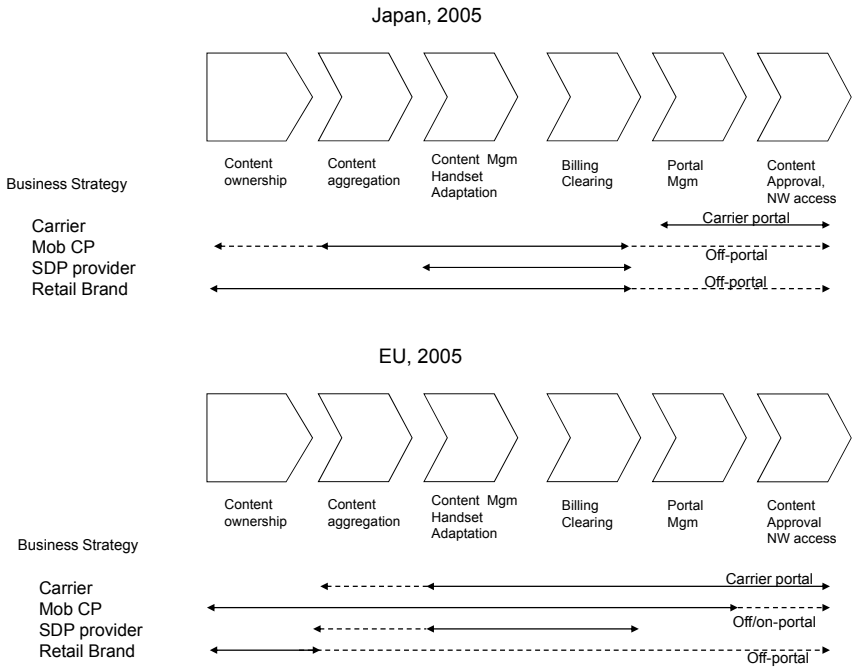
In 2005 the successful model in Japan had not changed much. The same players occupied the same space with the exception of large retail brands who managed their relation with carriers

directly, and off-portal sites for advertising and other consumer interaction (non-charged) were doing well. Interaction between web pages and the mobile Internet had also increased.

In 2005 Europe and the UK looked very different from the awkward situation in 2000. Carrier portals invested resources in their portals and service delivery platforms had become a key element for cost effective mobile Internet sites in the growing competition among carriers, retail brands and content providers. Operators and brands focused on the end-to-end experience and collaborated with handset makers and delivery platform providers.

DoCoMo created a special department (the Gateway department) dealing with the approval of new services for it i-mode portal already in 1998. Corresponding moves in Europe to manage supply chain platforms did not occur until Vodafone Live was launched in October 2002. In contrary to Japan (and potentially due to lack of gaming clusters) start-ups became the main suppliers of games in Europe. Three years later in 2005 these newcomers still dominated the market place, but produced most games on license from major game studios. Early on a significant license trade developed in Europe. In 2005 even 3D games were released for more advanced handsets, costing up to £7 to download in the UK.





The gaming industry is generally dominated by Japanese and Western game publishers like Electronic Arts, but only in Japan (and Korea) mobile gaming attracted the game publishers to invest significantly in end-to-end interaction with the consumers. Itochu, a Japanese trading house, had launched its successful Mobile G service in Japan, which built on free games to users in exchange for exposure to advertisements. They provided games for advertising, but it did not take off. This is an example of how difficult it could be to migrate business models from Japan to Europe. As a Japanese Itochu manager based in London said[37]:

> "We are not sure sometimes why we can't take a success in Japan and implement elsewhere. Japanese games are popular all over the world, so the problem can't be only the content",

As i-mode was launched in Europe 2001 onwards, Japanese content providers attempted to introduce their services. Japanese firms attempting to find partners for java applications pointed to a lack of horizontal coordination in the value networks in Europe making it difficult to find partners. Likewise, European managers found it difficult to find partners in Japan as finding a fit

[37] Interview, Mr Yamada, Itochu, 2007

with the operator portal structure was not always easy[38]. The technology systems in Japan and Europe were disconnected not so much because of technology, but because of different ways of charging for content. Parallel to the success in Japan, operators had achieved platform leadership and blocked services that did not fit their business model. Control over technology components and IPR are part of supply chain and industry platform ownership on the supply side. Controlling the buy-side means the platform has managed the create lock-in for users. We can use (Ballon & Walravens 2009) notion of control over assets and customers to compare platforms and standards in music and gaming in Japan and Europe:

	Control over customers	**No control over customers**
Control over assets	*System integrator platform & content aggregators* Vodafone Music, Spotify, i-tunes i-mode, Lismo (KDDI), Ovi	*Enabler platform* Brew (by Qualcomm) DoJa (DoCoMo), Symbian, Windows Mobile, Android
No control over assets	*Broker platform* Handango (on-line appshop), billing aggregators	*Neutral platform* Java 2 Mobile (by Sun) Linux (used by Motorola)

Table 12: Control over assets and customers in various portals

The regulation of prepaid usage affected differently the paths of innovation and business models in Japan and Europe: Europe saw a very high take up of prepaid rather than subscription usage, especially among niche segments (young SMS users to mention one), which had high profitability. In Japan prepaid was ruled out by the regulator as promoting criminal activity, leading to a 100% postpaid subscription market. As data uptake is higher among postpaid users, this most probably played a role in the higher data spending among Japanese customers. On the other hand, European operators often experienced higher profitability and better cash flow (especially in South Europe) from prepaid, which also decreased their incentives for bringing users to postpaid, with a slower mobile Internet uptake as result.

In the UK at the time, network operators provided what we would define as supply chain platforms, as they applied the generally available premium SMS standard. Different operators

[38] Interview, Peter Arvai, June 2008

had slightly different implementations, but few content providers or handset makers were aiming solely at one network operators or a particular specification. Instead industry consortiums, like the WAP Forum, launched specifications. In this way both platform sponsors and leading platform providers came together. However, technology innovation had a pace faster than regulation and new specifications provided by these consortiums resulting in these standards serving more as a general direction. The exception would be certain large operators like Vodafone (Live) and Orange (World) who launched with particular handsets and featured certain services and exclusive services.

I-mode by DoCoMo in Japan was from its start an integrated supply chain platform, providing content providers a launch pad for developing commercial applications and sites. As DoCoMo managed to create and control a technology system Eventually this supply chain for content providers turned into an industry platform (Gawer, 2009), as it had convinced handset makers to provide phones according to its specs, and service providers to supply content readable by browsers in the phone, synchronized with its billing systems, and regulated by its policies of what contents were allowed. Firms started up product development aiming solely at producing products and services aimed for the users who consumed i-mode-related services.

2005-2010: TV and advertisements

This chapter focus on how multi-sided markets for mobile video and TV services were created once 3G network coverage was available in Japan and Europe. In this chapter we continue to provide answers to the six complementary research questions at the end of the methodological chapter. As business model, mobile video and TV exemplifies how advertisement can be a primary example of payment for services.

Introduction

Once mobile portals were established with great success in Japan, and with less success in Europe, video and TV was thought to be one of the next big revenue drivers as there were more than 1 billion TV-viewing households worldwide (Informa Telecom 2008). It took some time before video picked up among mobile users. Cisco estimates that 90% of Internet traffic in 2015 will be generated by video, with mobile data volumes increasing three times as fast as fixe line Internet (Cisco 2011). As the proportion of traffic on carrier controlled portals had declined steadily since the inception of i-mode, advertisements were used by broadcasting firms as contents moved outside the walled garden. The issue was how to combine business models of broadcasters with those of mobile operators. The answer was initially to include mobile TV offerings in the official portals and charge subscription fees, as Internet offerings among TV channels were still not available. Advertisements as payment form for mobile services entered as a new revenue for broadcasters.

Global revenues from mobile video and mobile TV were estimated at US$1.1 billion and US$763 million, respectively, in 2007. This was dwarfed by global mobile music sales in 2007 of US$10bn (representing around 1% of Western European operator total revenue). The market of mobile TV had been worth substantially more if mobile advertising had been utilised (Informa Telecom 2008).

Traditionally, broadcast TV has largely been defined by the linearity of the scheduled content and has played a key role in making mass markets possible (Melody 2011). News broadcasts at specific times has been must-see TV for decades. However, this linearity has been disrupted by the appearance of digital video recorders as they have brought with them the ability to time-shift.

Therefore consumption of TV and film started to change already in the 1980s. Mobile TV can therefore be seen as a flexible tool to either extend the traditional way of watching TV (when broadcast) or extend Internet usage of streamed content.

Like music, but unlike games, TV can providing versions of the same content on TV, PC, the cinema screen, and mobile phones. The main challenge is to adapt the TV experience in order to create "TV for mobile" rather than simply broadcast the same content – "TV in the mobile" (Bria et al. 2007). The latter became the case in Japan in 2007 when mobile TV was launched on a national basis, as programs offered over the mobile broadcast network were identical to the TV broadcasts.

Overall, mobile TV turned out to be a disappointment, or even a failure according to some (Clark 2010), as revenue driver for broadcast firms, operators and content providers both in Japan and Europe. For operators, it was initially a reason for users to switch to a smartphone and get mobile data access, but in the medium and long term, operators have not been able to capitalise on this increase in data traffic with corresponding revenues. Instead advertisements-based streaming video providers had reaped most benefits. It is an example of how telecom operators have lost ground to new internet service providers in terms of creating profitable business models.

Mobile broadcasting emerge as alternative to 3G failure

Interestingly, most Japanese companies interviewed by the author in 2003 did not believe 3G would change the business models of mobile content, but rather enable new types of services, when packet transfers (data bundles) eventually got cheaper. This should be compared to Europe where 3G was hailed as the cure to disappointments in the footsteps of failed WAP and GPRS launches (Telegraph 2005).

Perhaps European operators should have studied Japan better in order to avoid disappointment. Most interviewed content providers in Japan 2003 concluded that 3G in itself was not enough: all-you-can eat data subscriptions were important for them to launch new services, as it would be too expensive for users if they had to pay for more data at current prices. One of the companies,

a pioneer in network- and role playing games[39], stated that users were put off by their first mobile telephone bill when packet costs had skyrocketed due to data rich games. Likewise, streaming and downloading of audio and video were referred to as non-attractive in Japan at the time due to expensive packet pricing. DoCoMo shut down its M-Stage video service (streaming of music) because of low revenues. The cost of data was also seen as too expensive by some of our interviewees at the time[40].

Expectations were high among buyers of 3G spectrum licenses in Europe who thought once networks achieved enough coverage, users would start consuming more data rich services. At the same time a worry prevailed among operators that mobile TV would congest their networks. In spite the perceived importance of 3G in the UK only around one 8th of mobile phone subscribers had a 3G phone in 2006, rising to just over one quarter in 2007 (Netsize 2008).

Navigation services – first 3G success paving way for video

The efforts on capitalising on the new opportunities offered by the 3G network to create new content markets during 2003 had been strong among all three carriers in Japan. KDDI continued to keep the initiative by launching its CDMA EV-DO network in December that year, but content providers were averse to bet on consumers wanting to radically increase their spending on data traffic. Navigation services were the exception that proved the rule, as they were data heavy and promoted through KDDI's "WIN" service (that included unlimited data).

It was not long before navigation services on KDDI phones supported by GPS and 3G became a success, celebrated also by Qualcomm who provided GPS-enabled CDMA chipsets to KDDI. Qualcomm had great hopes spreading their technology in other Asian markets (a struggle they won in Korea and tied in Japan and China respectively). i-mode's leading role as industry platform was threatened for the first time since its launch in 1999. In November 2003, KDDI introduced flat-rate pricing for data services. For the first time, from April 2003 through March 2004, KDDI's net increase in subscribers exceeded DoCoMo's net increase (they were 2.9 million and 2.1 million, respectively (Bradley et al. 2005).

[39] Interview, Dwango, Oct 2003

[40] Kiyoshi Mine, TI, July 2007; UBS Oct 2008

Also in Europe navigation (Google maps) became a top application in terms of data traffic generation[41], but not until 2008 when unlimited data packages were launched. The high cost of data was a bottle-neck in both Japan and Europe, but Japanese operators realized this insight five years before European operators.

Multi-sided markets: Users and firms

Unlike most other media marketplaces, attention is a critical part of the value chain, because it is demanded by advertisers and provided by consumers. On the supply side, content production is demanded by consumers and supplied by advertisers. In the mass media world downstream resources have traditionally been scarce (distribution, retail, production). Therefore revenues from advertisers are used to drop subscription prices in order to subsidize audience growth. Price discrimination follows. Value capture is a function of distribution and retail scarcity. Traditionally, broadcasting becomes mass media when scale enables low costs per user. In the Internet world, small-scale broadcasting has become economical, challenging such traditional mass media broadcasting (Bria et al. 2007).

Initially in Europe it was seen as important to enable subscription fees to capitalize on mobile TV and recoup infrastructure investment from exorbitant 3G fees. However, in Japan, Ericsson estimated an expected 10 million mobile TV enabled handsets shipped up to the summer of 2007, where the focus initially was on advertisements-driven revenues[42]. The main actors in the value chain of TV are content creators, broadcasters and distributors. As aggregators of content the broadcasters are the central players in the traditional TV value chain. At one end we have traditional advertising, product placements and advertiser funded programming, where the viewer pays by being exposed to advertisements. On the other end of the scale there are pay-per-view, subscription and carriage fees, where viewers pay the bill directly, often without being exposed to advertisements but sometimes as a combination of both. Distributors, for example cable networks, get their cut mainly from subscription fees and Pay-Per-View. Broadcasters tend to generate revenues from both sources.

[41] Orange seminar at LSE, July 2009

[42] Ericsson interview, May 2007

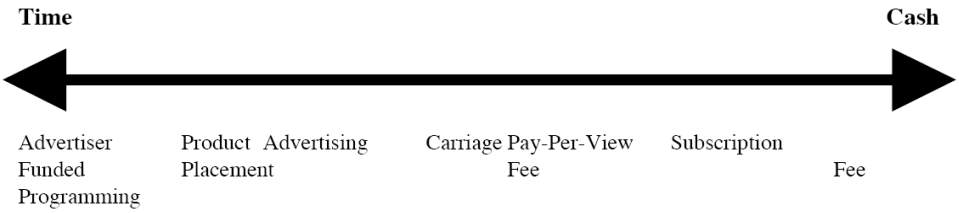


Figure 25: Payment for content on TV (Bria et al. 2007)

In other areas of the mobile contents industry advertisements took hold: Dentsu Inc, the largest advertising agency in Japan, estimated companies to spend a combined 8-10 billion yen on Japanese mobile sites accessed via mobile in 2003, which was double the amount of 2002. The companies placing these mobile ads had also diversified, 79% of advertisers were mobile content providers themselves in 2000.

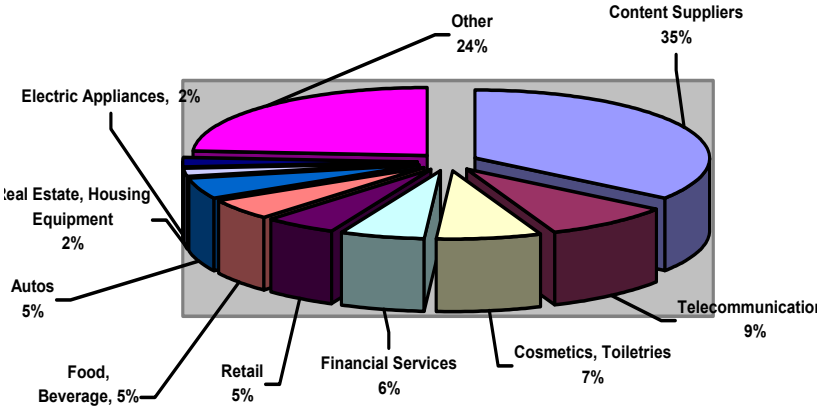


Figure 26: Break-down of advertisers using mobile services as medium in 2002 (Nikkei 2003)

Euro 2.8 billion was spent in 2005 among Japanese consumers and an estimated 40% of users shopped by ordering items through their mobile phone (women more so than men. Mobile wallet owners were expected to have nearly tripled from 2005 to some 37% of all users in 2006 (Mobile Contents Forum 2006). The hope was that mobile TV and its synchronized mobile sites could boost mobile commerce further.

The expansion of the digital domain consists largely of the reformatting and translation of content to increase availability. The digital version of previously analogue media is characterized

by a higher level of "liquidity", as digital content is more adaptive, transferable, and accessible to new platforms. The activity areas of firms involved in TV is summarized below:

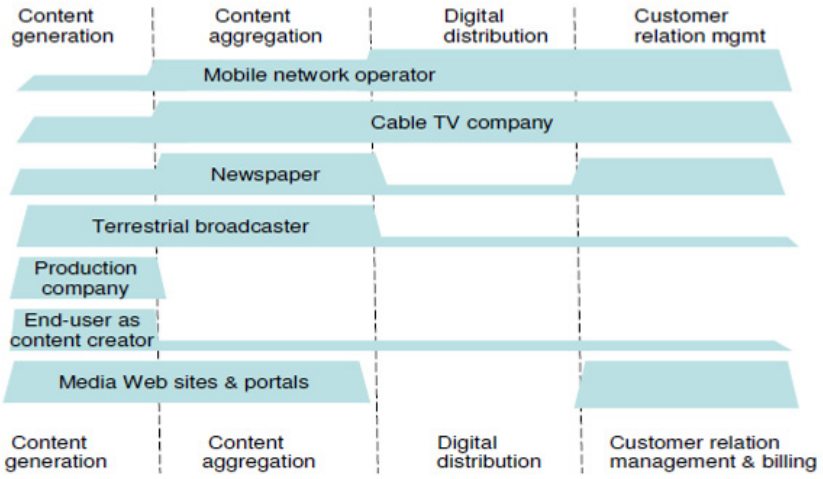


Figure 27: Firms involved in TV delivery (Bria et al. 2007)

Broadcast stations did not quite know how many really used mobile TV as it was a broadcast signal with no feed-back from the user. All in all mobile TV was not seen as advantageous to the mobile operators as it only increases the cost of the terminal without any clear benefit. However for infrastructure manufacturers streaming would be an opportunity to drive more traffic and network build-outs[43].

Cooperation of market actors is crucial for delivering services of high quality with the minimum of resources. For example, DoCoMo and Nippon Television Network (NTV), the terrestrial TV operator, agreed to a business tie-up developing content and related services combining mobile communications and conventional TV programs (NTT DoCoMo 2006). It was in 2007 possible to watch TV and access the mobile Internet, but the interactivity takes place through two parallel systems (TV signal and mobile Internet portal respectively) and are not embedded in the broadcasting stream. It was estimated that mobile TV in Japan did not have many active users in spite the fact that 7m people had an enabled handset in May 2007[44].

[43] Ericsson Interview, May 2007

[44] Ericsson interview, May 2007

Mobile TV services

It had been possible to view broadcast TV signals on pocket TVs for almost three decades without it being a mass market phenomenon. Despite this, actors from the broadcast and wireless communications industries saw mobile TV as a commercial opportunity (Tilson 2008).

Mobile TV was launched on a broad scale in 2006 in Japan with national coverage. Korea launched already in 2005. The UK saw many trials between 2005 and 2007, but apart from Virgin's one-only release of a TV-enabled handset, no handsets with broadcasting technology ended up in the shops (Informa Telecom 2008). Related content, such as voting or other interactive content, are made available to the user on the lower part of the screen. Digital terrestrial broadcasting was introduced in Japan already 2003 and made it easier to distribute IP based TV, and subsequently so-called "one-seg" mobile broadcasting[45], a standard developed and used in Japan. As European operators were still figuring out how to capitalize on their 3G investments at the same time (2003-2005) no major initiatives were launched by European operators.

Japan ventures into mobile broadcasting

Produced for big screens and long viewing time, the majority of the content in traditional TV channels and movies cannot conveniently be presented on small screens with limited battery life. Arguing on the back of pilot trials in Sweden, Bria et al. (2007) claim that 'TV for the mobile' - content produced and optimized for the mobile platform would be necessary. Content would then be adapted to small screens, enhanced with interactivity features, and its length tailored to consumption patterns of the mobile users. TV in the mobile on the other hand, simply implies that traditional TV content is re-broadcast to the mobile phone, and this is how mobile TV was launched in Japan 2006. Industry analysts in Japan were divided on the prospects for "TV in the mobile". A manager in the semiconductor industry was critical to the launch, claiming the broadcast industry did not realise they acted in a converged system and seem to ignore that Internet enables anyone to offer video content.[46] Others were more positive towards the launch

[45] Kogure, interview, Oct 2007. One seg referred to a proprietary mobile TV broadcasting system in Japan

[46] Kiyoshi Mine, TI, May 2007

of one-seg and saw it as one component in a larger mobile TV opportunity including other standards. A service delivery platform firm saw opportunities to gain first-mover advantage in exporting Japanese technology abroad[47]. As it turned out, Brazil eventually agreed to use the Japanese one-seg standards, so this bet was rewarded with success.

The Mobile Contents Forum, representing the mobile Internet industry in Japan, tried to summarise a general shift in service delivery demands in their annual 2007 white paper (Mobile Contents Forum 2006): user preferences had changed from a general interest in ubiquitous access 'whenever and wherever' to a more time-specific 'right here and now". In short, users started to expect not only to access services everywhere, but also a certain quality level.

Europeans embracing the mobile Internet

Vodafone partnered with media providers for exclusive content over the mobile channel, as for example with Sky Sports from November 2005 to March 2006 in the UK (BSkyB 2005). Orange had a similar portal where it invested in high-profile content like the Football Euro Cup in 2004 with UEFA, and "Starwars" video contents from Lucas Film during 2004-2006. Vodafone did not see a sharp increase of data traffic in their networks until beginning of 2008. It signalled that the mobile Internet finally had taken off in Europe. Much of this traffic increase came from mobile video (that was free of any content charges).

Streamed TV services became well known to the public in the UK when BBC launched the iPlayer in 2007, enabling users to watch programmes online through computers, gaming devices and mobile phones. BBC anticipated iPlayer would reach half a million users in its first 6 months of 2007, but it turned out to be 3.5m already in the first 3 weeks (Sweeney 2008). The success of iPlayer contributed to the debate over increasing network traffic and if ISPs (Internet service providers) should be able to charge extra for allowing access to iPlayer, as some observers thought iPlayer might "overload the Internet" (Sabbagh 2008).

Mobile TV initiatives among operators in the UK until 2008 are listed below:

[47] Interview, Mr Demarque, senior manager at Access, 17 May, 2007

UK	3	3G	3's mobile TV offering includes channels from BBC One, BBC News 24, BBC Three, Nickelodeon, Comedy Central, FHM, MTV Trax and ITN. 3 also offers Sky Mobile TV services, in the same three packages – entertainment, news and sports – as the other UK operators, and for the same price: £5 (US$10) a month per package. 3's ad-supported mobile-video service has racked up 6 million video streams since launch in April.
	BT Movio, Virgin Mobile	DAB-IP	BT Movio announced in 3Q07 that it had switched off its white-label DAB-IP service. BT Movio's only customer, Virgin Mobile, started retailing the service in October 2006, making only one DAB-enabled handset model available. Virgin had sold 24,000 of the handsets and had 5,000-6,000 subscribers to the service when BT decided to shut it down.
	Orange, T-Mobile, NextWave Wireless	MBMS	UK carriers Orange and T-Mobile announced this month that they intended to jointly pilot a new broadcast-mobile-TV technology that uses existing cellular spectrum, via TDTV technology supplied by the U.S. company NextWave Wireless. The companies have yet to announce their long-term plans for the project.
	Orange	3G	Orange's mobile TV service offers 29 TV channels, including CNN, Disney Channel, BBC One, BBC Four, ITN, Channel 4, Bravo and Cartoon Network, and six radio channels. TV packages cost £5 a month for a limited number of channels or £10 a month for all of them. The operator also offers Sky's mobile TV packages – Sky Sports, Sky Entertainment and Sky News – for £5 a month each.
	T-Mobile	3G	T-Mobile launched mobile TV over 3G in the summer of 2007. The operator offers the Sky mobile TV packs that are available from the other operators, in additon to the T-Mobile TV pack, which includes ITN, Channel 4, MTV, Nickelodeon and other channels. The operator's own TV package costs £1 for 24 hours or £3.50 a month.
	Vodafone	3G	Vodafone offers Sky's three mobile TV packages – entertainment, news and sports – for £5 a month each. This package was bolstered by the broadcaster's purchase of mobile rights to the English Premier League starting with the 2008/2009 season. The operator also offers a Variety Pack, with channels including BBC, ITV, Channel 4, Eurosport and various BBC radio channels, for £3 a month; a Racing UK pack, showing horse races; and a music pack, showing uninterrupted music videos.

Source: Informa Telecoms & Media

Table 13: Mobile TV initiatives in UK until 2008 (Informa Telecom 2008)

In Europe two parallel trends could be seen within mobile TV in 2007 according to Bria et al. (2007): telecom operators acquiring rights for their IP offerings over broadband funnelled into mobile content portals (what the authors call 'TV in the mobile'); and production of particular TV "mobisodes" and other tailor made content (what the authors called 'TV for the mobile'). In contrary to Japan European operators never launched any mobile broadcasting infrastructure, so the model for mobile TV followed the general boom in smartphone usage. Successful services were YouTube and iPlayer, rather than content produced by mobile operators. At least one Swedish pilot study indicated that viewers were not excited about TV Broadcast replicating standard TV services watched on the mobile phone (Bria, et al. 2007), which corresponded to the Japanese experience. In general, more attention was spent on large flat screens and high definition (HD) TV in Europe than on small mobile phone TV screens in 2007-2008.

3 UK was the first mobile operator to exploit the rise of social networking through its SeeMe TV, launched October 2005. Within 12 months, SeeMe TV had seen 14 million downloads averaging

approximately 1.5 million downloads per month, while offering cash in exchange for popular video content uploaded by users themselves. The service cost £2.5 per month for users (Informa Telecom 2008).

Further developments 2008-2011: Content as inhibitor and boost

With the success of iPhone, Sky Mobile TV decided to launch in the UK Nov 2009. Sky claimed they had millions of downloads of their Sky apps the year preceding the mobile TV launch for £6 a month (Sky 2009). BBC launched mobile apps for iPhone and Android devices in January 2011 and suggest the increased viewing away from desktops and the living room is "an expansion of primetime" (Halliday 2011). Once users had an incentive for unlimited surfing, operators called off the all-you-can-eat packages in the UK 2010 onwards (with the exception of Three) and introduced so-called "tiered pricing" where users had to pay for data volume. Not being regulated on price as the fixed broadband operators, mobile operators could therefore chargefor the increasing amount of data passing through their networks.

In Japan things took a different turn. After initial disappointment with one-seg TV, DoCoMo launched a mobile TV service called BeeTV in May 2009. BeeTV was a joint venture between TV production house Avex and DoCoMo, offering subscribers original content (produced for mobile phones) for 315 yen a month with several channels (Cisco 2009). It reached 1.5 million paying subscribers in December 2010 (Avex 2011). Mobile TV in Japan 2010 saw TV in the mobile both over broadcast networks and the mobile Internet.

Service delivery platforms

As platform owners in mobile TV would focus both on extracting fees from users and generate advertisements, we will in this section take a closer look at delivery of mobile TV including the underlying technologies.

Mobile TV infrastructures

The infrastructure for mobile TV can be categorized into two groups: standard mobile telecoms network and separate broadcast network for mobile TV (e.g. one-seg in Japan).

If TV services are offered via a separate broadcast network it requires a terrestrial transmitting network.

The Japanese proprietary solution "OneSeg" (one segment) operates on the ISDB-T mobile standard with an MPEG2 stream. In 2007 only broadcasting companies with existing licenses for terrestrial broadcasting could provide content, but in 2008 carriers and other media companies were also allowed to broadcast. The broadcast signal is one-way and no interactive usage is enabled through it alone. However, electronic programme guides (EPG) enables the user to switch between channels, and also the broadcaster to synchronise a mobile site with the programs broadcast.

A commercial launch of DAB/DMB based services took place in the UK by Virgin Mobile in October 2006.

There are multiple technologies for delivering Mobile TV services. The bit rate performance as a function of the spectrum allocated for use is almost the same regardless the radio technology utilized. There are no breakthroughs expected by improving modulation or coding, but spectrum allocation for future systems may give competitive advantages to one technology or another (Bria et al., 2007). DVB-H (Digital Video Broadcasting-Handheld) is the standard being encouraged by the EU Commission (EUC 2007). The TV content itself affects the service delivery capacity needed, as animated movies need lower bandwidth compared to conventional movies, to mention an example[48].

Coordination in the value network for TV services

In emerging technology system there are naturally many uncertainties concerning future market positions and strategies: Technology suppliers, mobile service operators, TV broadcasters, service content providers and others all aim at stabilizing their own position.

[48] David Lipp, 9 July, 2008

A manager at Sony Studios illustrates how the creation of "converged" experiences for users still demanded great efforts due to the fragmentation among mobile delivery platforms even for very large firms in 2007[49]:

> "The mobile platform offered a fragmented experience [in 2007]. A case by Sony Pictures is the "Afterworld" show. The storyline is one of a guy travelling the US from NY to Seattle after a national disaster. It was launched in 2007 as a multi-platform offering, including TV rights, IPTV, video on demand, mobile, and sponsorship. Each content type had their strength. The video clips were adapted to the connection speed, from 30 seconds (GPRS) to 2-3 minutes (3G). The show was launched in the US, UK and other markets.. Much effort was spent on producing different formats of the same content in order to accommodate the fragmented market of various mobile devices. It was a big effort for us to make this happen, even if we were a large studio."

The early start for mobile TV in Japan did not necessarily mean early profits for the operators, as there were no revenue streams for operators, but instead more expensive handsets[50]. In Japan flat data fees dominated the mobile data market in 2007 with more than 50% of subscribers in Japan utilizing this option, according to Ericsson analysis[51]. However, streamed TV services (based on progressive download mechanisms) had not become a notable revenue source for Japanese operators even in 2007 after five to six years of 3G coverage.

Technical components

Carriers in Japan early on demanded advanced device discovery and on-the-fly trans-coding for fitting images to the screen. In Europe there was an early interest in streaming (media player) and DRM, both driven by the media industry. Apart from these differences, the technology focus was similar, continued to converge and service delivery system innovation had become a global rather than local phenomena. A time-lag can be seen between Japan and the UK: large content

[49] Interview, David Lipp, 9 July, 2008

[50] Interview, Andre Demarque, senior manager at Access, 17 May, 2007

[51] Interview, Mr Ohtsuka, May 2007

providers in Japan started to outsource content management/adaptation later since mobile sites are larger but fewer in Japan than in the UK, and there are only three operating carriers.

SDPs increasingly became part of corporate IT systems with new demands 2005 onwards: administrative systems, service extension through third party solutions, compatibility with carrier walled gardens, quick scalability, and system integration resources through partnerships with established IT vendors (such as IBM, Accenture etc). As standard Internet formats became dominant, the weight of innovation changed from specialized telecoms solutions into adapted IT solutions for the mobile space.

Japanese enabler Access claimed in 2007 to have solved the technical bottlenecks around service delivery for mobile TV[52]:

> "The issues of service delivery are already solved technically for mobile TV. The current one-seg implementation is not advanced at the moment: just an analogue tuner to receive the program. However, we have developed CAS [conditional access service], payments, media player, and necessary databases - all this is brought together on the technical level, but it hasn't been implemented in the market yet."

The important technology components for mobile TV could be generalized into modules of "download manager" (for streaming and progressive downloading of files) and "media player" needed for playback and control of incoming media, such as TV.

[52] Interview, Mr Lemarque, May 2007

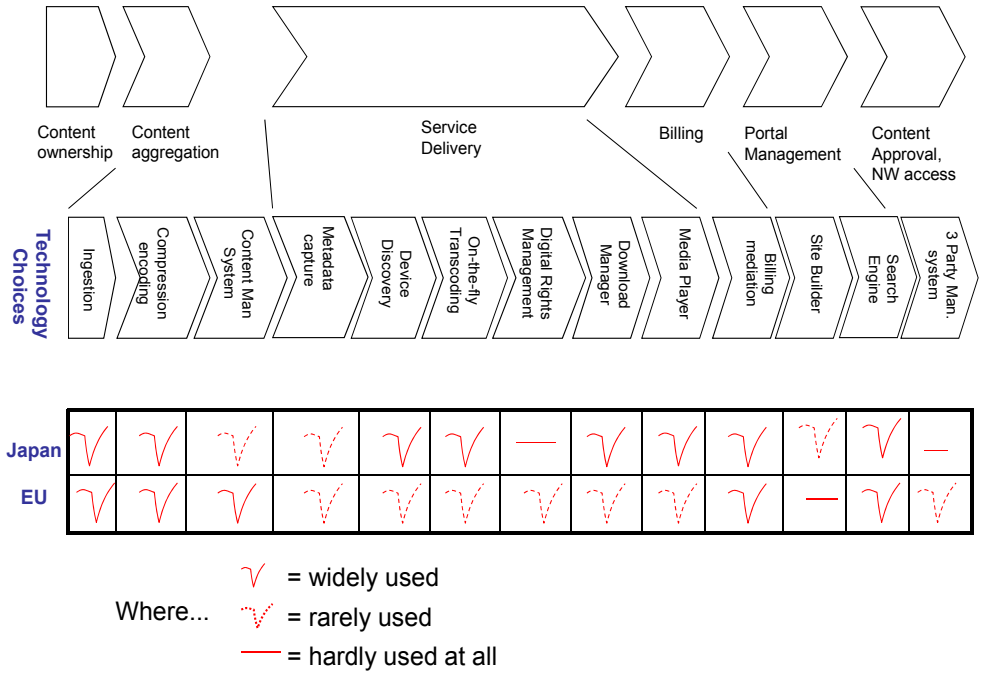


Figure 28: Technology choices in Japan and UK for service delivery platforms up until 2005-06

The figure above shows that although the same technology interaction is used in Japan and UK for content delivery, what differs is to what extent certain technologies are used or omitted, which in turn interact with the business strategy of the four key actors (carriers, content aggregators, SDP providers, retail brands). Increasing cost focus 1999 onwards drove a traditional two-fold segmentation in a maturing market: specialized component makers, and large system retailers who market off-the-shelf solutions.

Pricing and business models for Mobile TV

Compared to the operator portal business model, mobile TV first attracted most attention from handset makers and broadcasting companies. Network operators experienced an optimisation problem: TV services were used to improve the offering in the portals, which operators hoped would make users subscribe to more mobile data access and data bundles. On the other hand a balance had to be struck, as too many heavy users of streaming services (during peak hours) would mean more and expensive build-out of the network. Network operators use a subscription model whereas the broadcasting industry uses TV advertisements as main revenue source (where traffic volume is a non-issue). Handset makers wanted to increase the replacement rate

of handsets by offering new functions, but handsets are mostly subsidised by operators, so if no extra revenue is generated (mobile TV), there would be no clear business case for operators.

Various challenges occur when TV over the Internet (IPTV) is launched by telcos according to Waverman (2008): Economics not well understood (price sensitivities, and depreciation); Potentially greater competition for rights; Channel brands face potential disintermediation when program brands could reach consumers directly; Pay per view business models; Potential value erosion of longstanding windows (TV). Waverman also concludes that an opportunity with the Internet model compared to traditional broadcasting is personalization of content and advertisements.

As mentioned in previous section, the main challenges for mobile TV were not related to the quality or capacity of the available technologies, but rather the question of who will pay for, use, own and control a mobile TV network. At the heart of these unknowns lies the fact that economics was not well understood: Price sensitivity among customers seemed high, as mobile operators had very few subscribers on their mobile TV contents, and DoCoMo had to shut down their m-stage (TV streaming) due to customers shunning high data transfer costs. As outlined in the previous case, Japanese content providers had anticipated this reluctance among users to increase spending on data fees. Another more general explanation might be the question why mobile TV would become successful when portable TV had not seen any significant uptake during three decades prior to mobile TV introductions (Tilson 2008)?

Initially there were many issues to resolve in order to make the system of actors invest together and develop a complete service package that consumers were willing to pay for. Two future paths and scenarios were early on outlined: one where mobile TV is broadcast mainly over a dedicated broadcast network similar to traditional TV today; the other system utilizing existing mobile data networks over the mobile Internet. The latter combined with services like Youtube turned out to drive more traffic than dedicated broadcast networks in Japan and Korea. Qualcomm failed in convincing operators investing in their mobile TV infrastructure (called “MediaFLO”) and considered divesting their technology after years of fruitless efforts, resulting in a sale of the related US spectrum to AT&T in Dec 2010 for almost $2bn (Clark 2010; Forbes 2010).

In the Japanese broadcast sector 2006-2009 a decrease in TV advertising was not compensated with increased subscription fees resulting in an estimated 6% decrease of overall revenues[53] (Pouillot & Ollivier 2011). It is difficult to judge if IPTV is to blame as Waverman (Waverman 2008) suggests. However, observers in Japan concluded that in spite national roll-out of mobile TV and millions of devices in the hands of users, mobile TV did not deliver on its promise of shifting a downturn trend for the broadcast industry[54].

In the UK on the other hand, total TV broadcasting revenues 2007-2010 (advertisements, subscription fees) were kept intact as a decrease in TV advertising was offset by increasing subscription fees for premium channels (Pouillot & Ollivier 2011). An example from the UK indicated that as few as 0.1% of the users consumed 27% of the capacity on the network before tiered pricing was introduced[55].

From having been service providers, mobile operators seemed to accept not being able to compete with Youtube, Facebook or Google in the UK. They had turned into TV bit-pipes connecting the mobile Internet. On a higher level, video and downloads on mobile phones could therefore be seen as supporting the general shift towards cloud based infrastructures. On-demand infrastructure and storage (such as the service "Dropbox"[56]) was used increasingly by smartphone users 2010 onwards. Already in 2008 data traffic passed the volume of voice data in European mobile networks (Pouillot & Ollivier 2011).

Dominating TV business model: Mobile Internet rather than broadcasting

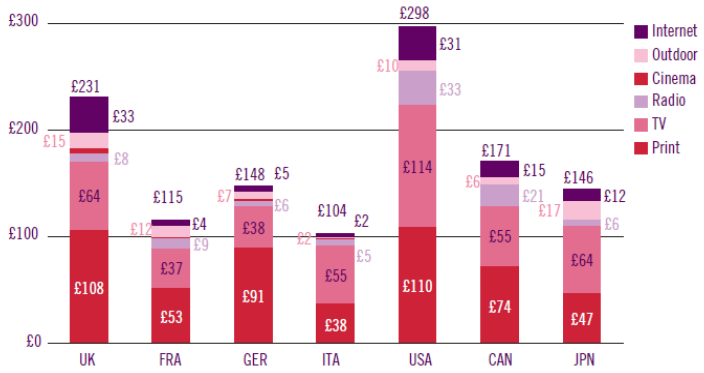
Users initially paid a subscription fee for accessing regular TV content streamed on carrier portals in Japan and Europe. On the supply-side broadcasting companies can charge advertisers for access to these customers. Below a break-down of ad revenues in leading markets including Japan and the UK is provided at the time of mobile TV introductions:

[53] down to 23.9bn Euros in 2009 from 25.3bn Euros in 2006

[54] Kogure, interview May 2007

[55] iDate event, Steve Jordan, head of EU regulatory, O2 Telefonics, 17 June, 2010, idate event

[56] www.dropbox.com



Source: WARC 2007 and Ofcom analysis

Figure 29: Advertising revenue per head in selected countries, 2006 (in Informa Telecom 2008)

The US leads advertisements spending per capita, followed by the UK. Japan had about one third lower spend per capita than the UK, mainly through less print and Internet advertisements. The UK was the world's leading market in Internet advertisements, and interestingly TV advertisements had a similar spend per capita in Japan and the UK. Nikkei Japan reported in 2007 that 40% of companies providing mobile sites ran mobile advertisements. The indirect revenues from advertisements early on became important in Japan, as only on-portal could be billed and no premium SMS model existed: only the mobile banner advertising business was estimated to 105 billion Yen in 2007 (Nikkei 2008). Albeit from a low level, UK mobile Internet advertising grew by 42% (Advertising Association 2007) during the first 6 months of 2007. The increasing penetration of smartphones had started to impact mobile advertisements revenues, but not through TV services, but rather Internet search and surfing[57]. Such advertisements revenues were outside the direct control of telecom operators.

Part of successful business models is to have agreements on intellectual property rights in place. As explained in previous chapter the karaoke companies in Japan had their rights cleared already with content owners, enabling quick roll-out in Japan to operator portals. Rights for films in Japan and UK were directly controlled by content owners. Broadcasters also feared disintermediation if mobile operators would start their own TV channels (as in Korea). Instead of handset makers fighting with operators as in the previous case (where operators won control of portals), broadcasting companies stepped up their efforts to make profits from mobile advertising and

[57] Orange seminar, July 2008

caused some concern among operators. Some trials in the UK even took place between Sky B Sky and Qualcomm without any operators being invited in 2006 (Lenningham 2007).

Japan venturing into mobile broadcasting

The battle over Mobile TV control in Japan from 2006 resembled the early battle of control in Europe in 1999 and onwards detailed in the previous chapter. In Japan the battle stood between mobile operators and the broadcasters, the latter seeing TV as their home turf. However, carriers controlled the only convenient billing system available for mobile phones As it turned out 2005-2008 Internet service providers increased their advertising revenues from streamed content while mobile operators could benefit from increasing traffic charges (but no content fees) while having to subsidize handsets where the addition of a mobile TV tuner could cost as much as USD90[58].

It could perhaps be seen as a sign of strategic convergence (Hamel 2002) when mobile TV was launched in Japan with broadcasting firms hoping users would consume the same content while on the move as when in front of the TV at home. At the same time adaptation of desktop services for the mobile phone was not seen as meaningful in Japan, where the focus instead was on developing services suited to the mobile user's specific needs, such as navigation, ringtones, and mobile commerce (Impress, 2006). The mobile Internet had launched with operator walled gardens in Japan 1999, but in 2007 the mobile Internet had turned into an open system where operators could not control the entry point any longer. The initial success of the joint venture between DoCoMo and Avex (BeeTV) shows that content produced specifically for mobile can be successful (as they had 1.5m users 18 months after launch).

UK going for mobile Internet

Let us remind ourselves that Cisco's Internet traffic model estimates that 90% of Internet traffic in 2015 would be generated by video (Cisco 2011). However, mobile TV and video had not been a priority in the European telecom/media debate. The general view was that in 2010 TV was being disrupted more on the TV screen by IPTV than from mobile phones[59]. The question in Europe was

[58] Kiyoshi Mine, Texas Instruments, 15th May 2007

[59] iDate event, Mike Corkerry, EMEA regulatory, AT&T, 17 June, 2010

to what extent operators should be service providers or just bit-pipes. Mobile advertising was a niche market in Europe 2010 for Internet service providers, and incremental billing from mobile data generated the most important revenue growth for operators[60].

Regulatory implications of increasing data traffic

Communication companies need to decide on a focus or diversification strategy: To what extent is higher network utilization (to the point where new investments are necessary) a business opportunity for network operators? Here we see the difference between mobile and fixed broadband investments; fixed infrastructure is generally a duopoly or monopoly with incumbents controlling assets defined as "public good" by the regulator. Therefore the price is not set by the market but under scrutiny of the regulator. Mobile infrastructures are privately owned (in the case of UK and Japan) and so mobile operators enjoy a higher degree of independence in setting their prices (with a few examples such as roaming fees in the EU). In the context of pay-back through pricing new infrastructure investments, mobile is pretty much an open market compared to fixed broadband.

Most legislation related to the Internet rely on national regulation, whereas the actual business is inherently international: users often access servers who are based in other jurisdictions than their own and e-commerce revenues and credit card payments do not consider national borders.

Another important factor is to what extent the regulator will allow for new distributors to broadcast to end-users. As the Japanese mobile data market grew, E-access, a fourth firm also entered the market, which was an effect of market opportunity rather than institutional pressure from the regulator. The regulator's role involves promotion of cultural diversity and pluralism of the media. The regulator initially limited operators in Japan to broadcast their own programs.

Comparing findings in the UK and Japan

When considering first mobile operating systems and service delivery platforms, different landscapes emerged in Japan compared to Europe. Due to Japanese operators controlling respective industry platform the control of the mobile Internet platforms were in the hands of

[60] iDate event, Gilles Fontaine, vice MD, idate, 17 June, 2010

the operators, even though challenged by broadcasting companies for TV. Handset makers, content providers, even infrastructure firms, were all delivering according to the particular standards of each operator (en end-to-end standardisation. In the UK the competitive landscape was level in terms of infrastructure, as all operators used the same 3G standards. Competition was on service and commercial terms rather than technical.

Japanese animated movies and comics have a huge following both in Japan and overseas. Many of related contracts for contents created in the analogue era prior to 2000 did not deal with digital distribution[61]. This meant a conversion of format, which technically was not difficult, but proved difficult from a contact point of view. In this negotiation, the conundrum for Japanese content owners was to monetise the emerging mobile market while not devalue its existing DVD and TV markets. Two-sided markets in TV and DVD for Japanese contents in Europe were established and well understood. Large operators in Europe obviously saw the contents as a unique and untapped property they could drive traffic with. However, mobile operators wanting 30% and upwards in revenue share made it difficult to convince Japanese content owners to get on the bandwagon. TV channels paid much more for quality content than the mobile sector in 2005-2006, so a 60-70% revenue share before distribution costs was not attractive to Japanese content holders. In summary technical aspects of platform delivery in Europe and Japan were similar, but close links between different industry platforms were hampered by different views on pricing. Attempts led by the author in 2005-2006 therefore failed due to issues with digitalised distribution and revenue share. In 2011 NTT DoCoMo established a daughter company offering apps for manga applications for iphone and Android in Europe.

Another reason for a disconnect between Japan and the European mobile markets was simply that coordination of technology and supply chains had come much further in Japan. In other words, providing “converged” offerings was easier in Japan for content providers than in Europe. Compared to portals 1999-2005 we notice how operators have lost control over mobile TV delivery in Europe whereas Japanese operator NTT DoCoMo has kept its portal relevant by setting up a joint venture with a TV production company. We also notice how browsers on

[61] Own experience in 2005 when the author attempted at brokering Japanese content to the European mobile content market

devices have become more powerful enabling streaming of content, due to 3G networks and capable devices. To enable such features, handset providers with proprietary browsers still used server solutions to adapt content (iPhone, Opera to mention two such examples).

2007-2011: Ticketing and user data

The previous two case studies have described fees and advertising as payment models related to carrier portals and mobile TV. In this chapter we study the digitalization of event ticketing and the role of mobile delivery platforms. As purchase patterns can be used to profile customers, we notice that *user data* becomes a currency within the value chain of event ticketing. Especially the case of discounted tickets will be studied, or what we call "dynamic pricing", a discount that varies with time (often used in the airline industry or hotel bookings). We also find that buying tickets with smartphones is lead application for users to engage in so-called mobile commerce. Part of the research was to follow a UK start-up from its inception, aiming at implementing business models proven from Japan in the UK market. Even though the base technologies for delivery platforms are similar, actual technology implementations, business practices and institutions proved very different, making a migration of successful Japanese business models into the UK market difficult. At the end of this section we provide reflections on recent developments to show how new operating systems can be modelled with our analytical approach.

Introduction

Virgin's Richard Branson saw opportunities already in the early 70s to challenge rigid institutions of music distribution in the UK (offering stores where you could listen to music, postal order and discounts) and changed the rules of the UK record distribution. Digitalisation first rocked the industry when CDs were introduced in early 1990s, but the distribution channels were not affected much. Ticketing for music events remained an increasingly "analogue" business until the dotcom boom at the turn of the millennium. Eventually Internet access challenged traditional ticketing distribution to live events.

Europe saw early success with mobile micro payments for parking tickets in Europe, whereas concert ticket sales were the most successful application of shopping on the early mobile Internet in Japan (Funk 2001). Growth in ticketed events has been strong during the 2000s in Japan and the UK implying digitalization of event ticketing provides us with a useful case to study service delivery platforms. As the UK managing director for a ticketing start-up firm said[62]:

[62] Last Second Tickets interview, January 2008

> "Typically with tier two concert, gig, sports, plays and comedy shows, major ticket re-sellers take an allocation of tickets for each event and then if unsold they return them to the promoter or venue. Mobile [phones] is ideally placed to overcome the serious issue of unsold concert tickets, hotel rooms, hire cars etc that could be considered distressed inventory."

Few things excite users as much as their favourite artists and often users go to lengths to secure concert tickets. Therefore live event ticketing could be seen as a lead application in order to introduce users to buy tickets with their mobile phone[63]. The main conundrum for venues is that very few ever sell more than 60-75% of available tickets, resulting in huge so called "distressed inventories" for the event industry. Well known concert halls outside London have average seat occupancy levels as low as 50%[64].

In 2003 50% of UK users used the Internet to buy tickets, 43% the phone and 7% bought in person. 63% of consumers bought their last ticket from a box office and only 37% through an agent (Oftel 2005). The share of tickets bought through specialised agents on-line was significantly larger in 2007 compared to 2003[65]. Consumers are also increasingly mobile and away from their own homes to experience increased outdoor leisure pursuits (Mintel 2008). The move into using the mobile phone as a payment mechanism for physical goods, such as tickets, was early on embraced by DoCoMo in Japan. Mr Enoki, managing director explained (Bradley et al. 2005):

> "A mobile phone is something that is always with the user. Some people here say that the mobile phone can become "lifestyle infrastructure." I like to think of the phone like a TV remote control for all the transactions in our daily lives—paying a taxi fare, boarding a plane, pulling up personal files on a conference room PC when you enter—you name it."

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[63] Tsutaya, interview, Nov 2007

[64] Sheffield Arena, interview, Apr 2008

[65] Last second tickets, interview, Jan 2008

Japanese operators enabled phones to read "QR codes" that could store more data than conventional bar codes. Various innovative services were enabled with QR code readers, which added little cost to already camera-equipped mobile phones. By scanning a QR code printed in a magazine or on a poster, users could obtain coupons, web links or promotion tickets. The mobile phone had become a tool to access and pay for physical goods.

Multi-sided markets: Users and firms

Ticketing is dominated by large firms for tier-one artists and events, but the Internet has meant a revolution for smaller venues and artists who can now market their events to a large audience at low cost. Discovery and social networking around artists calls for good Internet capability on the mobile phone meaning the Japanese market saw was well developed with some concerts having 50% of the tickets sold via mobile phones, whereas Europe is still lagging behind. As tickets cannot be considered micro payments, a lack of payment capability over phone means that in 2011 a very small amount of tickets in Europe were purchased via mobile phones. Mobile Internet users are used to pay for things with their mobile phone. In 2008 the desktop Internet had only 30% of total revenues coming from paid fees (and almost equal shares of advertisements and commerce). The mobile Internet on the other hand saw 76% of revenues generated by paid fees and only 5% from advertisements (Meeker 2010).

The UK is the largest event ticket market in Europe, and the second largest live event market in the world after the US. Ticketing sales is the top of the iceberg in terms of estimating the value of the entertainment sector as sponsors, advertisers, merchandise, food and drinks must be included in the total business value of events. Ticket sales and music downloads are complementary offerings delivered to ever more mobile phones as integrated solutions by carriers and handset makers. Total 2003 UK advance ticket sales (off-line and online) were £1.4bn with £580m through so-called primary ticket agents and the rest through reselling (Oftel 2005). In 2006, 59% of UK adult Internet users attended a live music event over the last three years (Mintel 2006). As comparison Japan's Internet ticket sales was estimated at 1.8 trillion Yen in 2007[66]. Below is a chart of ticket sales in football, music concerts, and West End Theatres during the first half of the 2000s:

[66] E-plus, interview, Oct 2007

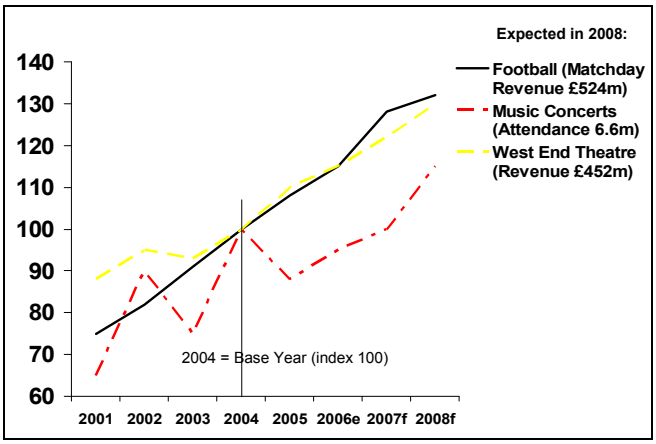

Figure 30: Event ticket sales in UK 2001-2006 (Mintel 2008)

3A Entertainment	Listed as UK's largest promoter with 811k tickets sold Sep06-Sep07
Ticketmaster	Sold 128m tickets in 2006 for USD7bn in 20 global markets
Live Nation	Started own ticket sales in 2008, corresponding to about 14% of Ticketmaster's volume (Branch 2008)
Piccadilly Ticketline	£3.8m sales in 2006

Table 14: Major vendors and sales in the UK 2007[67]

Total tickets sold via Internet (e+,pia,lawson,CN playguide)	1.8 trillion Yen (£9bn)
Main ticket firms	Ticket Pia, CN Playguide, E-Plus, Lawson Ticket, Ticket Navi, Rakuten Ticket, Tsutaya
Average ticket price	£35-£40
Most popular categories (e+ estimation between resale/venues)	30% music (60% of this is sold by ticket resellers) 30% theater (70% of this is sold by venues) 25% sports (65% of this is sold by venues) 8% classical music 7% event
Number of live events per year	110,000
Internet share of sales	Low price tickets: 30-40%; Typical premium music & theater tickets: 50%-60%

Table 15: Major vendors and sales in Japan 2007[68]

[67] Data from respective corporate webpage

Venues and promoters

While some venues organise their own events and act as their own promoter, most venues are simply hired by promoters and therefore the ultimate control of ticket pricing rest with the promoter. While the promoter is responsible for ticket sales of an event they may allocate some marketing budget to the marketing department of a given venue. In the concert ticketing industry, especially promoters hold a strong position as they manage the bands, and ticketing revenues traditionally were funnelled through box office sales, or telephone sales (with subsequent mailing of physical ticket). Promoters give around 10% of the ticket price to ticket sellers in both the UK and Japan[69]. However it is common practice that on-line ticket sellers add a booking fee to the full face ticket price and then rebate a share of that back to the promoter. This is then used for local marketing, typically newspaper advertisements and flyers[70].

Venues put on their own gigs often and if not then they either lease out the space to a promoter or make other special arrangements (iTunes Festival for example). The promoter often advertises on MySpace and Facebook as well. Finally, in addition to selling tickets on places like SEE Tickets and TicketWeb, the promoter often has a cheap list. The first respondents to an email will be on a "cheap" or reduced cost list at the door. This often promotes walk ups[71].

Entertainment Plus (e+), is the foremost Internet retailer of tickets in Japan, competing with larger and over-the-counter competitors PIA and Lawson Ticket. One of the interviewed companies claimed overall 30% of ticket bookings are done via mobile, but for certain genres like concert tickets, it's as high as 50%.

Mobile operators and handset vendors:

Negotiating with mobility for ticketing doesn't come without a price: increasing demands from users for convenient purchasing and delivery are combined with higher expectations of

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[68] Interview, E-plus, Oct 2007

[69] Own interviews

[70] This section inspired by Last second ticket interview (2008)

[71] This section inspired by Last second ticket interview (2008)

interactivity. This challenges the position of traditional distributors and opens up for new competition from mobile carriers and on-line data base owners.

Mobile operators have associated and sponsored music events since long. In the UK, the operator O2 Telefonica has even acquired the former Millennium Dome and renamed it the O2 Arena. O2 became iPhone first-mover among UK carriers when launching in 2007. In 2008 it was reported that 60% of O2's iPhone users in the UK used more than 25MB data per month. By comparison less than 1.8% of O2's other contract customers used comparable amounts of data[72]. Meanwhile Vodafone focused on Blackberry for its mobile data offering, which was particularly popular with corporate customers, but not a good platform to expand into music and ticket sales due to its optimisation towards email.

Mobile operators possess huge databases with data about their users and given the permission (through opt-ins) could tailor offerings to their customers. They could consequently profile who wants to go to what live event among own subscribers. The same logic applies to handset makers and music shops, where Apple's i-tunes have been most successful. Mobile operators and handset makers could then team up with event ticketing firms in order to cross-sell concert tickets with digital music.

Apple established such a tie up with Ticketmaster to cross-sell downloads with Ticketmaster's concert tickets. Ticket sales and music downloads are complementary offerings delivered to ever more mobile phones. Orange Wednesday is an offer for only Orange customers to watch cinema for two at the price of one.

On-line and mobile ticketing

As mentioned in our first case, CD sales have decreased in sales since the turn of the millennium, but many artists have experienced an upswing in live performance revenues. It was estimated in 2007 that touring revenues constituted two thirds or more of total profits for bands, and in the case of "the Rolling Stones" around 90% (Live Nation 2007). A shift in profits and focus within the music industry from record sales to live events had taken place.

[72] O2 corporate webpage

The following trends could be seen in the industry driven by increased usage of the Internet (from own interviews):

- Cross-selling of tickets to clients, whose contact details and purchase patterns are contained within retail databases
- Increasing social networking and community building towards the fan base, in order to increase interaction time and understand what is popular
- A shift towards a converged music industry: functional boundary analysis rather than just a technology-driven approach for Internet sales
- A focus on expanding the mobile contents market with digital tickets for events relating to music, cinema, and other events

Advantages of using mobile phones as sales channel include: high penetration and the immediacy of motivating people to make spontaneous decisions through discounted prices. Rakuten in Japan claimed that 11-12% percentage of their users buy products with their mobile in 2007. For travel approximately 10% of booking are done on the mobile.

Mobile commerce was estimated to exceed USD 4billion in Japan in 2005 and more than an estimated 40% of users were shopping items through their mobile phone and women more so than men, as explained earlier.

This trend was relevant to the UK market as carriers in the UK looked to Japan to enable cross-selling of mobile contents (ringtones), with concert tickets and live events. During 2005 to 2007 the corresponding amount of e-commerce triggered by mobile phones in the UK was negligible. In 2009 the mobile content market in the UK was estimated at £122 million. In 2010 the mobile commerce was worth 1 trillion yen, an increase of 4.2% over the previous year (Mobile Contents Forum 2010).

Mobile event ticketing services

Mobile phone browsing played an important part in event discovery and in customer interaction much earlier in Japan than in the UK. Tsutaya is the largest CD and book retailer in Japan. In 2002

60% of Tsutaya's mobile commerce related to mobile mails sent to its members (Funk 2006) and they boasted 8 million mobile members in 2007 (and twice as many pc mail recipients). Tsutaya sent out bimonthly generic offers to all their members in 2007 (email and mobile mail). Japanese ticket resellers have been proactive in using the Mobile Internet to not only sell full-priced tickets but to clear distressed inventory and achieve very high seat occupancy. An example of this is a company called Ticket Lawson, a major ticket seller in Japan that sells 50% of their entire inventory via mobile phones[73].

iTunes and Hollywood-based Ticketmaster teamed up in a deal that saw see Ticketmaster incorporate digital album sales into its website. Ticketmaster will promote albums from more than 700 touring artists by giving the option of buying their album at the same time as purchasing tickets in one transaction. Those who purchase an album with their tickets are given a link to the iTunes download store where they can proceed with the download. iTunes offered USD1 off all purchases bought in this way until the end of 2008.

In the UK, Orange has collaborated with "Gigs and Tours"[74], a notification service for mobile users. Users can browse artists, add artists they are interested in, and their location[75]. Users also need to register their billing address, delivery address (as tickets are delivered home), and credit card details. 48 hours before tickets go on general sale, users get the chance to book. Orange also has a download music store, and its already extensive film focus (Orange Wednesdays).

An outlier in the European market is Norway where Nielsen (Nielsen 2006) reports that Telenor's mobile phone customers could buy cinema and concert tickets, use vending machines, buy DVDs, pay for parking, and even book airline tickets back in 2004.

Service delivery platforms

In our analysis of boundaries among firms and technologies in the event ticket industry, we return to our concept of the "service delivery platform" to analyse how coordination affects

[73] Ticket Lawson interview, Nov 2007

[74] http://www.gigsandtours.com/gat/about_us.asp

[75] http://www1.orange.co.uk/gigsandtours/

technology and firm boundaries. Service delivery platforms are only partly standardised, many of them proprietary (like Apple's app-store) and only after 2005 in Europe started to develop from local systems towards offerings of generic modules supporting sales of physical goods. As discussed in previous case studies, tight coordination of delivery technologies with operator portals was an initial success factor in Japan. The example of Japan informs us about the usage of mobile email and mobile Internet sites. Mobile email (only packet fees apply) was in most cases a much cheaper way of communicating than SMS dominating in Europe (Funk 2004). On the other hand, no premium charges can be associated with mobile email, and users change their email addresses often, making it more difficult to create a user profile (used for targeting offers or adverts) from mobile email addresses than SMS.

Let us remind ourselves of the generic model introduced in previous chapters of underlying technologies for mobile service delivery:

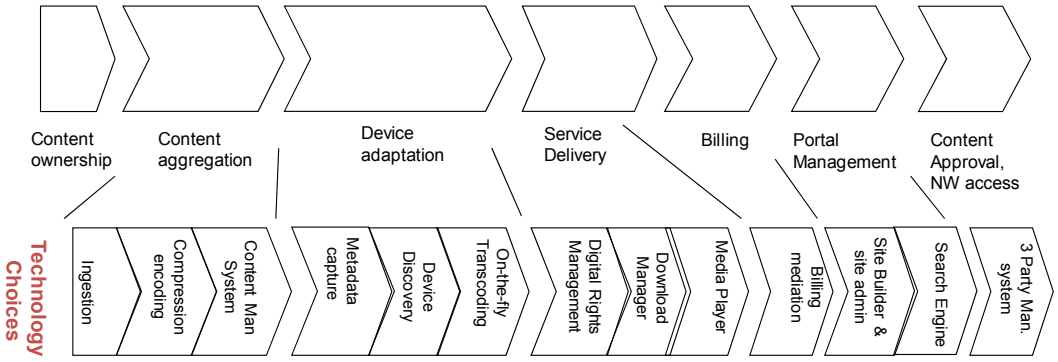

Figure 31: Generic model of mobile service delivery

In the following we will expand above model to fit ticket delivery Discovery and payments of event tickets on-line which was well developed in both the UK and Japan, but Japanese users were well ahead in using mobile phones. Young Japanese users booked as many as half of their concert tickets via the mobile Internet in 2007 before it was even possible in Japan. As mentioned earlier leading e-retailer "Tsutaya on-line" (the largest CD and book retailer in Japan) boasted 8 million mobile members in 2007 and twice as many pc mail recipients. Tsutaya sent out bimonthly generic offers to all their members (email and mobile mail)[76]. The UK model of

[76] Tsutaya, interview

offering last-minute discounts was interesting to Japanese observers, as institutional pressure makes discounting a sensitive subject[77].

Event tickets are traditionally sold either through pre-ordering of tickets, direct sales over the web or ticket offices. Pre-order sales generate commission and total demand of the event can be estimated among primary ticket sellers by comparing with previous events in the database.

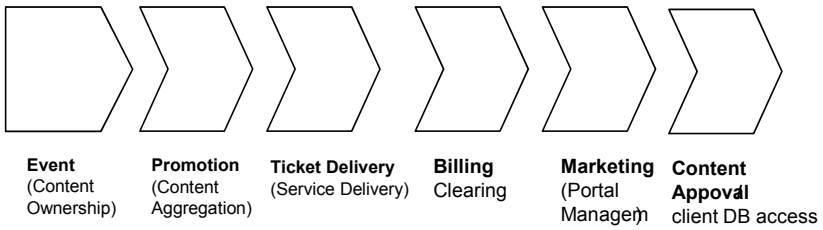

Figure 32: Ticket delivery value chain

Web ticket issuers offer an information service with notifications to users of future events, often free of charge. Members log into these services with their mobile phone number, email address or other user name. The information service from ticket providers could include e-mail magazines issued according to the entertainment genre, customized mail to registered members and single event requests. For large ticket providers these two information services drive tens of millions of emails a month by each the top tier ticket sellers[78] in Japan and the UK. In summary, tickets are picked up by the customer in a convenience store, printed at home (or delivered as barcode to the phone), delivered to the home, or picked up at the box office. Let us visualize above description of the ticket value chain, a modification of figure x above. The figure below will serve as model for our discussions:

[77] E-plus, interview; Rakuten interview, Oct 2007

[78] Interview e-plus, Feb 2008

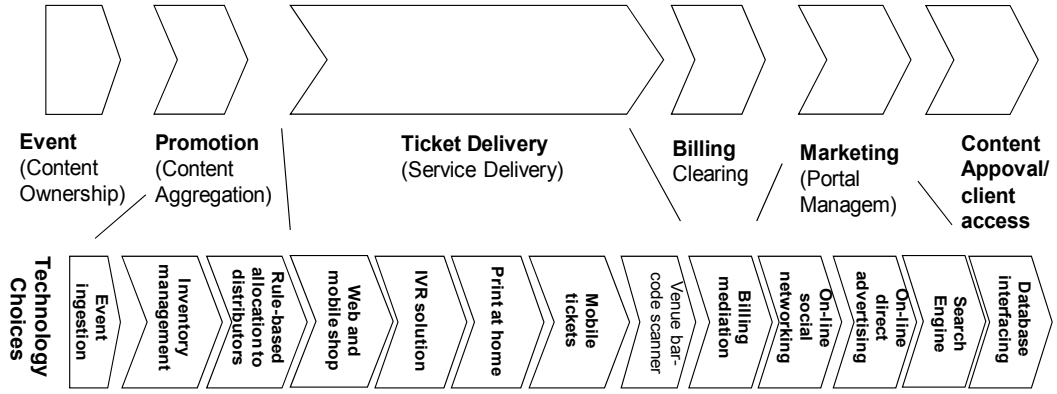

Figure 33: Technology choices for ticket delivery (desktop and mobile)

In the digital ticket value chain above, a flow can be seen to run from the event (a type of content ownership or at least control), to its promoter who manages artists (and often box office revenues and walkups), then a ticket delivery firm providing customers with either the physical ticket through the mail or digital receipts (acting on behalf of the promoter), and billing clearing (often through credit card payment). The actual marketing of the event could go through a database partner who provides details of potential customers (client database access).

Technologies worth mentioning that are slightly different from the case of operator-controlled portals are: intelligent voice recognition (IVR) where users can order and pay for tickets via a voice recognition system when calling the ticket vendor; print at home (used extensively also by low-cost airlines); bar code scanners at the venue where print-at-home or standard tickets are identified and matched to ticket inventory; and the usage of social networking sites for marketing and building fan groups.

Customers regard “ease of buying” to be of primary importance, as earlier mentioned. The main quandaries for the ticket vendors is to maximize the output of the system through ease of buying (including delivery) and availability of tickets to customers. Both ease of buying and ease of collecting are directly related to capabilities with the service delivery platforms. Price is still an issue, and phone sales were regarded as opaque on face price and charges.

For e+ in Japan up to 30% of bookings were done via mobile in 2007, but for certain genres like concert tickets, it was as high as 50%. Each month 40 million more or less customized emails were sent to their membership[79]. The majority of mobile shopping of physical products, including tickets, in Japan is "cash on delivery", including tickets that are usually ordered and picked up at services stations in convenience stores.

The introduction of social network functionality takes the following forms: directly on a web portal belonging to a firm related to ticket sales, or through on-line forum such as Facebook and Myspace. Several ticketing firms launched forums on their web sites, where users can comment upcoming gigs, or even connect to other fans.

Pricing and business models for mobile ticketing

Digitalization and the usage of the Internet lower the cost of communication, which could lead to shorter decision times, but also alter the revenue logic and architecture in previously stable value chains. An important target for management is to innovate and position a firm to create bottleneck (reverse salient) ownership in the value chain of a particular industry (Jacobides et al. 2006)

Digitalisation also contributes to change the bargaining power among actors in the event ticket delivery chain. The general trend for ten years of declining physical sales from CDs in the music industry has partly been compensated by an increasing revenue stream from live events. Previously, promoters did well with local marketing events with flyers and newspaper ads. However, the strong position of companies with profiled databases (such as mobile operators and web-based music shops) means that the bottlenecks in the value chain have changed towards actors with on-line billing relations. An example of a promoter moving into the space of ticket reselling is the firm "Live Nation", who announced January 2007 they will drop their relation with Ticketmaster (the world's largest primary ticket reseller), but eventually merged in 2010, creating a company that sold around 140 million tickets a year and owned 140 concert venues (Pelofsky & Adegoke 2010).

[79] E-plus interview, Oct 2007

Dynamic pricing

Even though a large discount market exists for tickets in the UK, this is not generally the case in Japan. The main focus in both markets is on full-price sales and to reach out to punters as early as possible in the process. This is to offset the risk of having distressed inventory on the day of the event. The convenience factor of buying and getting tickets delivered had to be utilized in order to make mobile ticketing successful[80] in Japan. Low pricing is used as a last-minute teaser to off-load distressed inventory among venues and agents. However, with limited time at hands the challenge is to reach out with offers to those who are interested.

The flipside of offering discounts is that it could potentially undermine brand value, the full pricing strategy, and therefore overall yield. It seems as if many users do not mind giving away personal details and purchase history as long as they get a good deal. Tradition and institutions also define the bargaining culture. As the managing director for a ticketing company in Japan said[81]:

> "In Japan there are not so many discounts. It's not possible to sell discounted tickets in japan as audiences get disappointed… It is different to Broadway and West End as it is more industrial [in Japan] and no selling outside the theatre."

A gradual negotiation takes place in many cases of event ticketing between customers and the firm. A standard face value is set when an event is announced and the price could fluctuate until the event has started, at which time the value is zero. An aspect of pricing strategy is therefore to balance total sales (tickets sold) compared to potential value dilution (if customers get used to cheaper tickets, full price ticket sales might suffer). Many venues act as their own promoters such as the Barbican in London that hosts approximately 40% of their own venues[82]. This gives the venue flexibility to control its own pricing.

[80] KDDI interview, Oct 2007

[81] Rakuten, interview

[82] Last Second Tickets, interview, Dec 2007

Generally two kinds of discounts are offered on tickets: bundles, and percentage discounts. Some ticketing firms take a holding stake in major events (such as e+ and its investment in the Japanese version of the musical "Blue Man Group"). Such controlling interests enable flexibility to offer last minute discounts on these shows. Mostly Japanese web ticket firms resell for promoters and two types of agreements dominate between ticket sellers and promoters: Either an agreement related to sales levels and corresponding discount levels as a function of remaining time; or it is negotiated on a case-by-case basis with the promoter prior to the event day. Most or all of discounts and offers are distributed through a closed membership in Japan, as great care must be taken to avoid brand dilution through public discounts[83]. e+ for example, did not operate a loyalty scheme built on points visible to customers as of 2007. Instead it relays offers on its own discretion through mining of its member database, based on user preferences and purchase history[84].

From an m-commerce perspective locational mobility enables customers to do impulse purchases while on the move, and access the Internet when they are outside their home or office. Operational mobility enables customers to save receipts and tickets on their mobile to pick up electronic tickets. Interactional mobility includes the temporal (time) aspect, which enables a more intensive search and purchase of tickets until the last minute.

Mini case: Entertainment Plus (e+) in Japan:

Entertainment Plus (e+) was established by the Sony group and leading credit card company Saison Group in Japan 1999. The rational was to merge the Sony knowhow of Internet and music marketing power with the Saison group's ticket business. In 2001 e+ started selling discounted tickets over the Internet. It was estimated that e+ had sales of around 30bn yen in 2007[85]. e+ has the largest web sales of tickets in Japan, focuses on ease of use, and edge in promoting live entertainment together with artists, utilizing direct and personalised communication with its more than 5 million registered members (in 2007). The mobile site supports users throughout the business cycle in acquiring information, purchasing, and ticketing:

[83] Interview, Mr Nakamura, Tsutaya online, 2007

[84] Interview e+, 2007

[85] Interview, MD Rakuten, Oct 2007

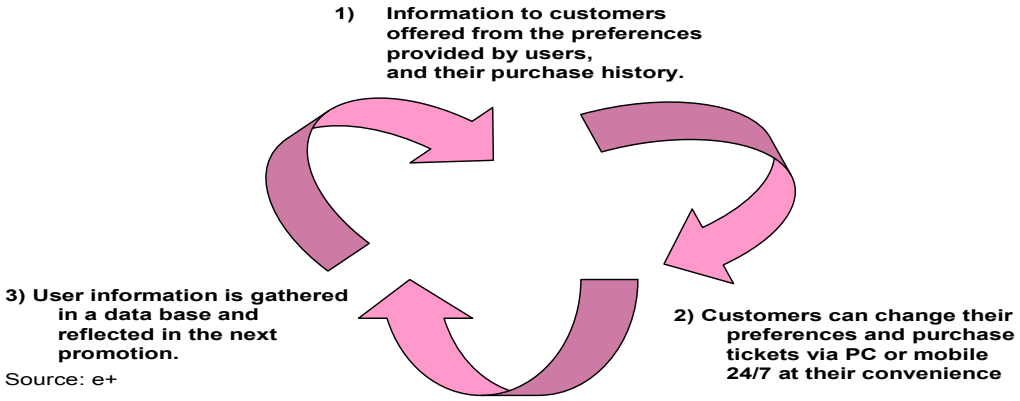

Figure 34: How web ticketing firms decide which customers recieve offers

Through the membership database, e+ is able to further personalize and provide recommendations to its members based on their preferences. Ticket sales mainly consist of admission tickets for music, concerts, plays, movies, and amusement parks. Advertising is done through all media channels, but with a focus on the Internet. In the Tokyo area e+ had an estimated market share of 30% of total Internet ticket sales beginning 2008 (called "Playguides" in Japan). Its leading market position is further strengthened by its collaboration with KDDI, Japan's successful second largest carrier. e+ provides the back-end to the mobile ticketing sales on the carrier's official portal[86].

e+ summarises their market strategy in the following: No physical shops, web and mobile sales only, database utilisation, extensive use of pre-order and e-mail magazines, and a strategic partnership with Seven Eleven for issuing tickets. Tickets are sold either through pre-ordering of tickets or direct sales. Pre-order sales generate commission and total demand of the event can be estimated by comparing with previous events in the database. e+ offers an information service with notifications to users of future events free of charge. Members log into these services with their mobile phone number and email address (users in Japan change their mobile email address often to avoid spam). For these two information services, tens of millions of emails a month are delivered. Through the direct sales channel member profiles are gathered for the

[86] KDDI interview, 2007

database together with sales information. Tickets can be paid on-line via all major credit cards, or in all major convenient stores (open 24/7 in Japan) up to the same day of the performance.

User data as a currency

In previous two cases studies mobile service provisioning consisted of offering a portal with access to contents or broadcasting mobile TV and video either through a portal or directly to users. In most such digital content types a commoditised service is offered to the users and there is no time restriction or limited supply. When dealing with physical products or tickets on the other hand, traditional supply limitations affect service contracts and the related bargaining process. The profiling of customers and usage of social networks in order to provide offers to the right customers means that data about users becomes an important asset for firms selling and delivering event tickets. The time left to an event has a direct impact on the price, so being able to reach out to the relevant audience, and having access to their contact details is crucial.

Building up databases of previous event-goers is a way of contacting users again with offers. However, many venues lack the automatic systems fort this. One concert hall surveyed used software lacking an automatic entry for the type of event an attendant actually booked for. So while the venue had captured in excess of 20,000 email and mobile numbers there was no efficient means of connecting particular preferences with each ticket holder. Therefore, the percentage of consumers transacting and purchasing from this database could be expected to be significantly lower than a well tagged database. The database was simply not designed with targeted marketing messages in mind.

A venue or agent that wants to reach out to customers would need to build their own database or collaborate with others. The primary concerns of database owners, such as credit card companies, when providing access to third parties to their members are anticipated to be the following[87]:

1. Would my data be 100% secure and not possible to be used by a 3rd party?
2. Are the offers sent to my database legal, ethical and represent honest value?

[87] Last Second Tickets, interview (2008)

3. If my members use the benefits will their order be fulfilled without any negative feedback?
4. Can I see independent evidence to prove that my members are happy with the service?
5. Can I control the number of messages a member receives in any one month?
6. Is the ticket agent that accesses my members a credible and well-funded company?
7. What management time, effort and potential cost will I incur in implementing this solution?
8. Does the ticket agent have the technology to be able to scale to send messages in a timely fashion?
9. Is the data warehouse company solid and credible?
10. Will the commissions I receive from the agent be worth the hassle of communicating this service to my database?
11. Could receiving discounted messages from my company tarnish my brand value?
12. Will the security procedures and processes be validated and checked by a credible 3rd party company?

Ways to mitigate these concerns would be to grant access only to the meta-data and not the actual contact information of these databases. In that way a ticket operator could guarantee to never spam users in a particular database. Independent third party audits on the database security procedures could also be used in order to set up guidelines or even follow data protection laws. When ticket agents with a distribution network approach database owners they need to communicate the benefits, such as good commission and guarantees that of control (how many times a month the ticket agent is allowed to contact users, universal stop commands and other opt-out procedures). More precisely the following benefits could be envisaged[88]:

- Member Benefit: Provides database members with tangible benefits at no cost to the database owner
- Churn Reduction: Greater loyalty is likely if tangible benefits are offered
- New Revenue Stream: Provides a new revenue stream based on a percentage share of ticket sale

[88] Interview, Last Second Tickets, Jan 2008

- No Capex: Matching engine provided at no cost by ticket delivery firms
- Database Integrity: Minimal technical integration requiring only a database 'look-up' or post and forward
- Automated Process: Once the database fields are correctly tagged it is an on-going automatic process requiring no manual input

Cross-subsidisation and so called product placements in movies utilizing customer profiling is exemplified by a media executive[89]:

> "The vision for an integrated media firm is to profile its customers to deliver what their clients want. A case could be as follows: a customer is walking down Leicester Square in London. He interacts with an advertisement, e.g. a mobile short code from advertisements in a magazine, and receives a video trailer for the latest movie and an offer of a discount ticket. By profiling the location of the customer the integrated media firm is also able to locate which cinema is nearby, offer a DVD purchase afterwards, and then involve the partners around the movie (car makers, mobile phone makers, beverage brands etc, depending on the movie). This is what multi-channel media advertisements is about!"

Users are becoming increasingly aware of how their search and application data are being stored and used in order for firms to expose them to advertisements. Some users are keen to have access to more extensive services, and some user groups are increasingly demanding a certain amount of control over how data is processed in return. Liebenau et al. (2011)[90] outline how the response to privacy concerns varies among different user groups:

> "While privacy awareness is at an all-time high, the diversity of privacy understanding and technological capabilities is widening. As many companies have seen, different user groups respond differently to user education, empowerment initiatives and control settings, user interfaces, and privacy policies".

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[89] Interview, David Lipp (July 2008)

[90] NFC and Privacy (2011), Liebenau et al., Forthcoming

Storage and handling of data is affected by the increasing usage of outsourcing, virtualization and so called “cloud computing. The “Privacy Mark System” in Japan states that firms as of 2007 are obliged to report privacy breaches to the administrative body JIPDEC (JIPDEC 2007).

Liebenau and Karrberg (2006) outline three trends in corporate information security and related risks for corporations: Reputational risk from breaches; lack of benchmarks (although numerous metrics exist, firms report they feel unable to gauge appropriate levels of investment for security); changing boundaries (private online customers use a wide array of products and have levels of security far below those applied within banks or telecom carriers).

An analyst from the European Network and Information Security Agency discuss the relation between information security risk and contractual responsibilities (Mitrakas 2006):

> “Failure to implement appropriate information security measures might have severe consequences for the implicated organisation. Under private law, failure to implement security measures might result in damages for breach of contractual obligations (e.g. negligence or breach of a fiduciary relationship)..”

It should be mentioned that all off-portal services do not only have advertisements and profiling as their primary revenue model. “Mixi” is a social networking service in Japan with more than 20 million users according to themselves (Mixi Inc Co 2011) and focusing on premium charging for avatars and customized homepages. Mixi went from 17% of its usage being mobile customers in 2006 to 72% in 2009 (Meeker 2010).

Comparing findings in the UK and Japan

From our interviews it seems as if Internet purchasing as percentage of total sales are low in both Japan and the UK for events typically attended by mature and older audiences, such as for opera and classical music. Dynamic pricing is offered mostly as member benefit and not part of the overall pricing strategy in Japan compared to Broadway and West End where discounting is widespread.

Some European telecom firms with successful payment brokerage solutions have tried to enter the Japanese market. Vodafone attempted to start a premium charging market in Japan when it took over J-Phone, but it was rolled back when Softbank subsequently took over the network in 2006[91]. An interviewed manager for a foreign firm well established in the Japanese market in equipment manufacturing had a positive outlook in 2007 on their payment solutions in Japan, but in 2011 still had not managed to establish themselves as a mediator towards service providers[92]. What seemed obvious in Europe was not accepted by the operators in Japan.

By 2007, the spread of on-line commerce and standardisation of underlying technologies meant new actors entered the market (operators) and provided others with the means to supply a larger part of the value chain with their services (promoters, retail sponsor brands, web portals, all moving into ticketing and strengthening relations with end-users). Ticket resellers have answered with consolidation – as an example UK ticket firm "See Tickets", second largest after Ticketmaster, was acquired by Stage Entertainment in mid-January 2008 (Smith 2008).

In 2007 the UK ticket sales terminated on handsets were still miniscule. There were two major reasons for Europe's lag: the mobile phone was not yet mature as an e-commerce tool; In Japan pre-booked tickets without deposit can be picked up in a nationwide convenience store network. However, in terms of mobile content downloads, the UK was a leading market in Europe and cross-selling of mobile music downloads and tickets increased exponentially during 2007 and onwards, with the introduction of ever "smarter" phones. The change of the value chain for live events has changed between 2000 and 2007, which we attempt to visualise in below figure:

[91] Interview, Makio Inui, UBS, 2007

[92] Interview, Ericsson, July 2007

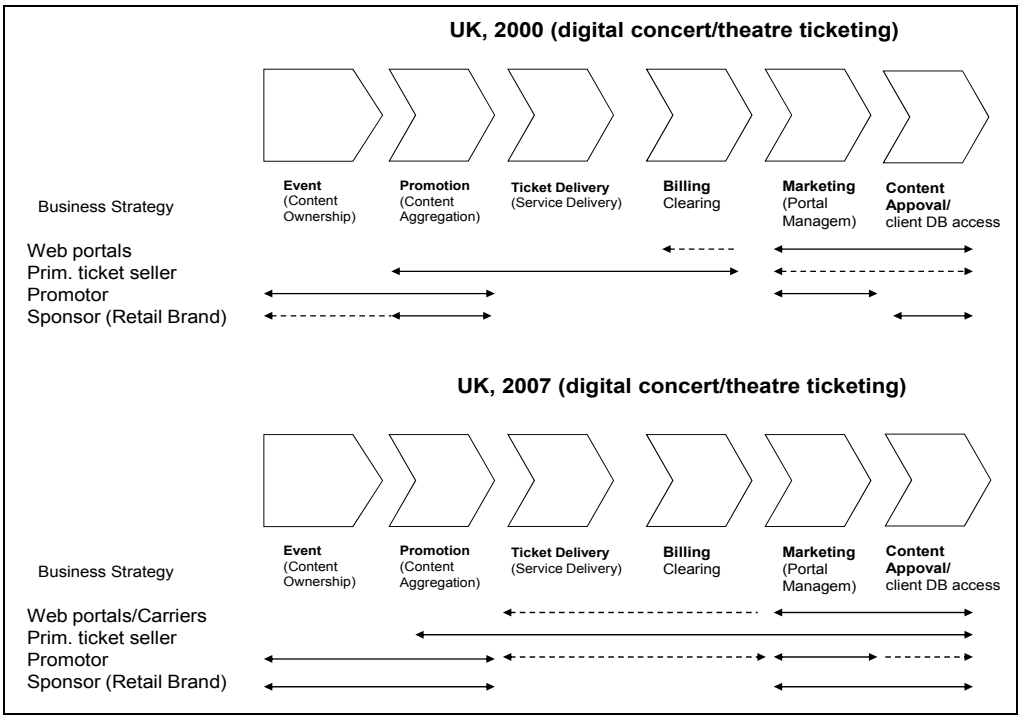

Figure 35: Position among firms in the online ticketing value chain in UK

In Japan we had a similar situation with the main difference that mobile operators early on became a marketing channel for tickets. The fact that ticket payments were cash on delivery was also different. But in principal it is a similar story.

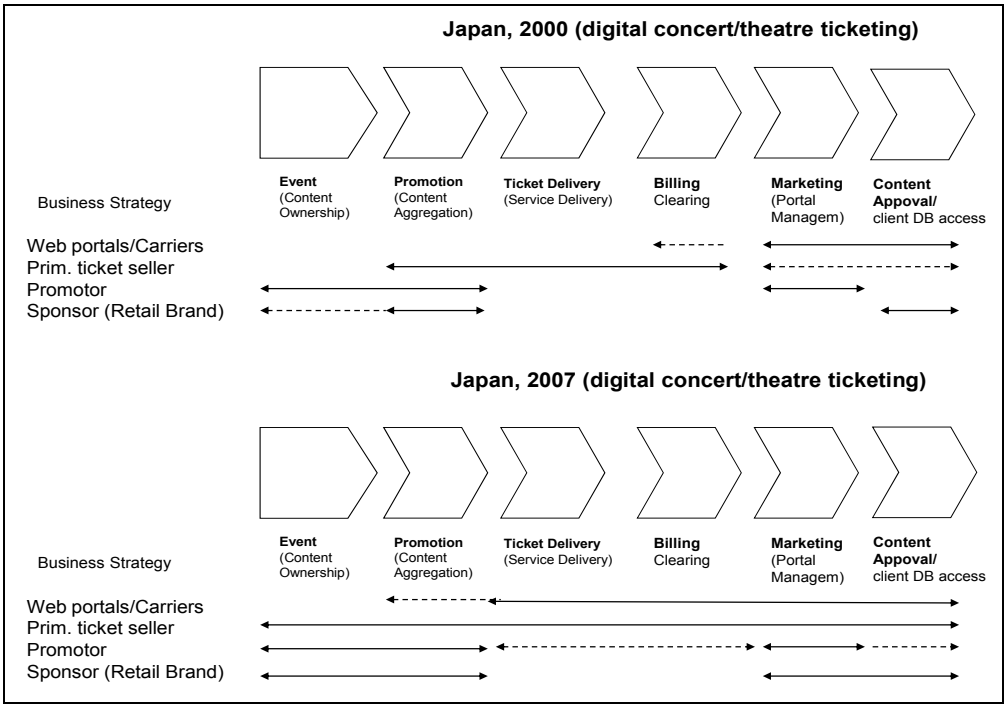

Figure 36: Position among firms in the online ticketing value chain in Japan

User data became sensitive early on when location based services were introduced by operators and content providers. In Japan navigation and map services were introduced by leading firms like Panasonic (through its subsidiary "Increment P[93]). However in Europe, such services had its break-through with Google maps later in 2007 when data services became common among smartphone users. Certainly in Japan early on, but increasingly in Europe, the handling of user and transaction data came under scrutiny from privacy advocates, with various degrees of industry responses mirroring what was seen as best practice by respective regulator. In Japan the Privacy Mark (P-Mark) was introduced as a conditional gateway for service providers to pass if they stored user data on their servers. In the UK self-regulation was promoted by Ofcom, whereas Germany regulated more strictly on storage of data in particular telecom regulation (source). The international nature of the UK content provisioning meant that much of user data was stored outside its borders anyway, and a legal grey zone occurred. Therefore regulators enforced self-regulation to influence network operators in developing policies to protect its customers, including child protection and under-18 rules. The limited ability of advanced browser capability kept mobile phones from transmitting much information at the outset. However, GPS and location services changed this situation and in Europe to a larger degree than in Japan network operators and handset providers lost the ability to control privacy, as it became an agreement between application users and providers.

It should be further stressed that service environments offering users privacy and a decreased sense of uncertainty open up new business opportunities. Mobile operators and handset manufacturers already have a reputation for enabling service providers to act in a both secure and careful privacy environment. Leading operators in Japan and Europe, such as DoCoMo and Orange France, restrict access to mobile phone numbers or the identity of users to its service providers. This reputation enabled DoCoMo early on to start a joint venture with leading Japanese advertising firm Dentsu for trusted mobile advertising in 2000. As carriers in Japan offer email addresses and various spam protection, they have achieved a prime reputation for taking care of users' privacy. In Europe carriers and handset makers offered secure devices and connections for mobile email (through Blackberry), but as of 2011 still lack a central position as trusted service provider for privacy and security extending into mobile commerce.

[93] Interviewed in 2003

Reflections on recent developments 2007-2011

As the mobile service market has come to be dominated by smartphones towards the end of the 2000s, an increasing share of computing were shifted to devices from server-based delivery platforms[94]. A competitive market for operating systems broke out in 2007 when Apple and Google launched i-phone and Android operating systems in both Europe and Japan. Whereas in Japan the operators established their own industry platforms 1999 onwards, the European market did not see any one firm controlling much of mobile Internet market until the application stores emerged 2008 and onwards, mostly provided by handset makers, and the new operating systems. The US market, having lagged behind in mobile implementation, saw its software and online firms who already dominated the PC market acquire smaller players. Operators gradually lost control over content distribution, as i-tunes, the Apple store, Android, and Blackberry provided easily downloadable applications. Some analysts even spoke of "portal death" (Root 2010).

The Japanese operators on the other hand controlled the value chain and drove the technical innovation of handsets through its collaboration with selected vendors. The Japanese market was characterized by incremental and modular innovation, where backwards compatibility with existing contents was ensured by the carriers. New innovative services, such as Java games, full-track music download, and GPS navigation, was coordinated both on a technical and market level by the operators. In this way complements were developed by carriers in Japan to their own core platforms of billing and delivery. Platform leadership through technical and market excellence was still kept by Japanese carriers in 2011.

During 2010 and 2011 it was also clear to operators in Europe and the US that mobile data services had become an important growth driver for revenues, as it had been in Japan since the

[94] Most of the formal interviews were carried out 2007-2008, but active participation in the business of mobile services in Japan and the UK 2005-2006, and the author being part of the founding team of a mobile ticketing start-up 2007-2008, provided further empirical exposure. We use our model here to analyse events from archival research 2008-2011

launch of i-mode in 1999. Frustration in the mobile service industry with slow uptake among users has been replaced with an optimistic outlook on services as driver for mobile telecom industry revenues and investments. In a survey of operators globally IDC found correlations between operator size and application store strategy (Winther 2010): Smaller operators used application stores to improving the customer experience, whereas larger operators use application stores to reduce customer churn rate; Smaller operators differentiate themselves with local content whereas large operators focus on large retail brands; small operators work with partners in select areas only (platforms, applications), whereas large operators are comfortable in working with partners throughout the value chain (meaning application stores exist side-by-side with operator portals).

In Europe network effects occurred early around billing technology platforms, as the operators in order to compete, allowed third-party billing through premium SMS. Adverts for ring tones took off, contributing to a consolidation among billing aggregators (Mobile 365, MBlox, Ericsson IPX, Netsize, Bango, and Qpass dominated in Europe 2006). However, operators or billing aggregators were not driving much innovation downstream or upstream in the value chain, implying there was no other accepted industry platform apart from SMS. Billing disruption for operators did not occur until Apple sidestepped operators with credit card billing for its "Appstore" in 2007.

A market for technology developed early for service delivery components in Europe and less so in Japan. More specifically it was a market for supply chain platforms being combined into delivery of desktop contents to mobiles, as large IT firms developed their mobile solutions towards advertising, content delivery, and billing solutions. Several examples showed how cash-rich US IT and media firms took the chance to enter mobile delivery, often by snatching up small European platform firms. It started with Yahoo buying fellow Californian firm 'Overture' in 2003; then Amdocs acquiring Qpass in 2006 who had earlier acquired Austrian 'UCP Morgen' in 2005; Oracle's acquisition of Swedish 'Hotsip' in 2006; Microsoft buying French 'Motionbridge' in 2006; NTT DoCoMo buying German content delivery firm m-X in 2008. There were a few European firms with resources to acquire other European venture firms: Gemalto's increasing shareholding in French SDP provider 'Netsize'. Sybase (owned by German SAP) was an exception acquiring leading US billing aggregator 'Mobile 365' in 2006; Ericsson's acquisition of Swedish SDP provider 'Drutt' in 2007; and UK SDP firm Bango founded in 1999 was listed on the London Stock Exchange

in 2011. Leading billing aggregator mBlox, still operating in 2011, was founded in London 1999 and merged with US firm MobileSys in 2003, being the first firm to offer premium SMS in the US market.

Roughly one in 10 phones shipped in 2007 were smartphones compared to 2011 when it was estimated that one in four phones in the first quarter worldwide were smartphones (Williams 2011). Nokia's failure between 2007 and 2011 to capture the smartphone market spurred an up-shake and decision to partner with Microsoft in February 2011 to develop the next generation devices. This provides new opportunities for Microsoft to leverage their application business system from the PC market into mobile applications, but also limits Nokia's independence as they stopped investing in their own Linux-based platform called "Meego". Nokia's market share has dwindled to 25% (Palmer 2011) compared to 35% only a year earlier, and its application platform Symbian has received much criticism. Meanwhile operators have seen their SMS revenues challenged by email and other applications (Bradshaw 2011).

Apple's walled garden also operators with service delivery platforms, where content is being adapted for the Safari browser on iPhone. In this sense iPhone does not deviate from our model of service delivery, it is rather a version i-mode but with only one device (albeit different versions of the software). To visualise he dynamics of mobile platforms a chart of the US market for mobile operating systems 2008-2010 visualises this well:

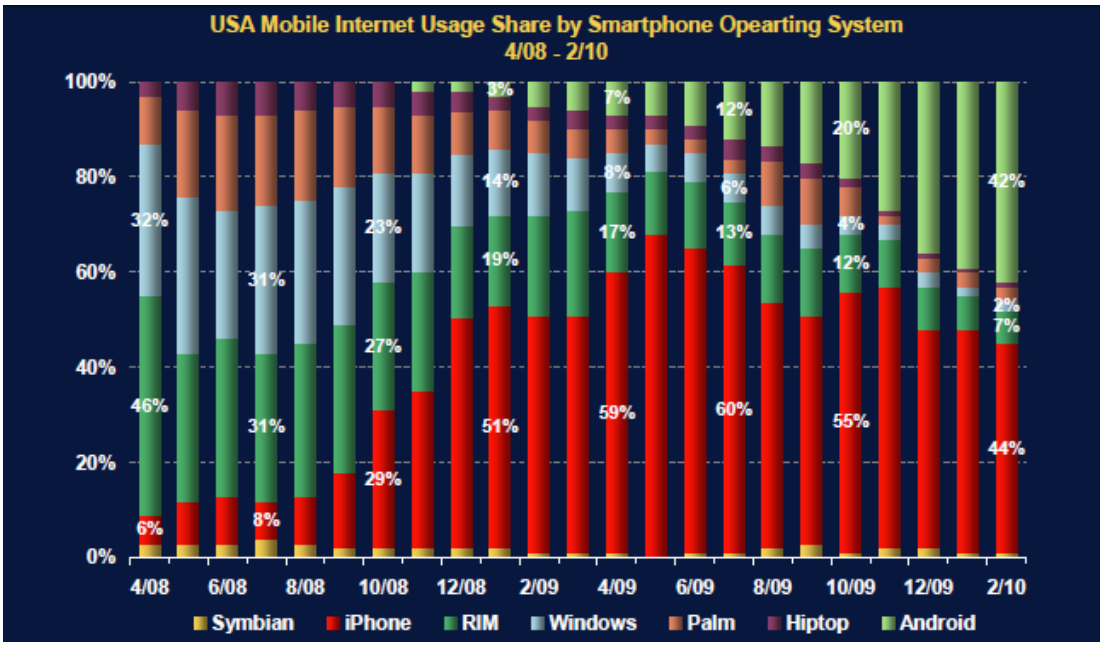

Figure 37: USA share by smartphone operating systems; Source Admob in Meeker (2010)

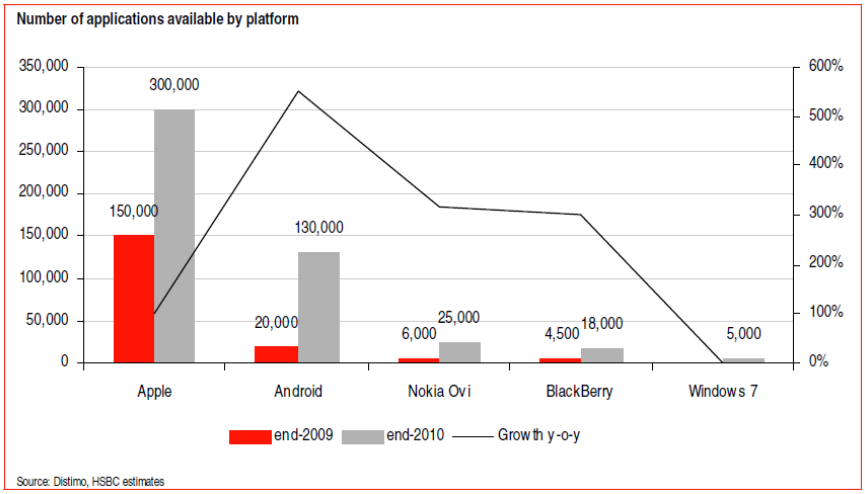

Figure 38: Number of applications available by platform (HSBC 2010)

No third party store challenged the operator portals for paid content until the Apple Store was launched in 2007. The US and Europe pioneered the introduction of application store platforms sponsored by handset makers (Apple Store, Android market, Ovi store, Sony Ericsson) where users paid for content via bank payments instead of the mobile operator bill. However, users still have a close relation with carriers, who also provide most of the handsets. In this sense carriers and application store providers have different ways of merging their platforms in providing offers: offering an existing store within an operator portal; side-by-side stores where operators promote other stores than their own; a joint service model where operators do billing, customer service, whereas the application store (such as Nokia Ovi) does wholesale, aggregation, and quality testing.

Some see patterns and paths followed by digestion, and new growth as in the desktop industry: infrastructure build-out, then platform establishment, growth of applications, then commerce taking off. That pattern was seen in the 1990s for desktops and a similar trend can be seen during the 2000s for mobile phones (Meeker 2010). Messaging is an example of how proprietary standards (SMS in Europe) has eventually been replaced by email (on smartphones) and eventually device-agnostic messaging (but proprietary) with Facebook. Global usage time spent on social networking was estimated to have surpassed that of emailing in 2007 (Meeker 2010).

The popularity of Youtube and even Netflix in the US (streaming movies) suggests that smartphone usage of video has high potential, and expected to drive traffic (Cisco 2011). However, our cases show that consumption does not follow the traditional TV consumption patterns that the broadcast industry expected back in 2006-2007.

The rise of platform sponsors, as outlined by Eisenmann et al. (2008), was first influential in the Symbian consortium where several firms such as Panasonic and Psion did not mediate any transactions themselves, and then overtaken by the Android project 2007 onwards, sponsored by Google. In Google's case an increasing interest in the mobile Internet as driver for advertisements revenue justified a corporate strategy of "donating" a new platform (a mobile operating system) to the market place, while benefitting from search-related advertisements, where Google already had established an industry platform of their own. The connection between the desktop world and the mobile world, was something that DoCoMo had never been interested in, but it enabled Apple to establish a "converged" system between the desktop and mobile Internet. DoCoMo was only mobile Internet gurus and never attempted to be a challenger in the desktop world. Hence Apple had created a stand-alone system they controlled with some of the most popular mobile devices (at least according to their own huge fan base!). In this way Apple managed to establish a global industry platform, whereas DoCoMo only established a national industry platform and failed in Europe.

The fact that Apple offered both services and a proprietary platform for delivering services, make users find themselves locked in with one supplier. The success of i-phone, which built partly on the "i-pod" brand for music distribution, meant a strong negotiation position for Apple when bargaining with operators. Apple demanded unlimited data bundles for users, which later were replaced by data allowances, and served as an educational factor for users who accepted a new standard. There is strong competition in 2011 between Apple, Blackberry, Google, Nokia, and Microsoft in the OS market. Certain handset makers having committed to one of them (Sony Ericsson to Android to mention an example) or use their own OS (Apple, Blackberry). As Eisenmann et al. (2009) describe it, some actors could therefore be seen as platform sponsors (or at least hybrid like Microsoft, Google e.g.), rather than mediating transactions directly themselves (as in the case of Apple who operate a walled garden). As operating systems establish and assert themselves in the market as important service delivery platforms (due to network

effects) they simultaneously become institutional forces as they also regulate the multi-side markets they help to create.

Part IV

Innovation at the borderlands: Analysis & Conclusions

Summary

During the period 1999 to 2011 mobile services have gone from being an isolated value chain for proprietary contents to becoming a driving force for the digitalization of the economy. It is exemplified by recent articles in the mainstream business press on topics such as competitiveness of malls competing with online retailers (Barwell & Packard 2011), how telecom operators could face lower valuations if they only provide connectivity and become "bitpipes" (Campbell & Browning 2011), and how firms in banking and payments are challenged by mobile service providers (Root 2010).

We have shown how Japan came off to an early start by introducing Internet applications for mobile phones and how Europe trailed. By studying the industry over a long period of time, from 1999 to 2011, patterns of convergence and disruption can be mapped with delivery platforms as indicators of industry coordination and technological innovation. Our model presented at the end of the methodology chapter enables analysis on at least three levels: technology architectures, value networks, multi-sided markets and business models. This model enables a thorough analysis diminishing the attention given to cultural aspects, which often are taken as excuses among Westerners for ignoring the underlying structure of innovation in Japan.

The resulting dominant delivery platform designs for the mobile Internet emerged through industry consolidation and convergence rather than deliberate consortia-driven standardization from within the telecom industry itself. Early success in the 1980s and 1990s in Europe saw one-sided markets for voice and SMS in mobile telecommunications being coordinated in the global standard GSM. However, the European-dominated WAP Forum and (its later reincarnation) the Open Mobile Alliance failed to coordinate stakeholders of multi-sided markets for the mobile Internet between 1999 and 2005. No open platform whereupon the industry could grow beyond the existing SMS platform was established which retarded the convergence process in Europe for uptake of email and other mobile Internet applications.

The development of service delivery platforms for the mobile Internet could be described in phases: firstly the *invention* of isolated systems with no external access to service development; then *development* of internal platforms that had point solutions, but still high investment and

running costs; then the *innovation* phase where SDPs became commercially available and featured service abstraction through open APIs enabling third party integration; then a technology *transfer* when the first supply chain platforms were deployed for multiple media channels (not only mobile contents); a further *growth and consolidation* phase followed where supply chain platforms coordinated service management functions in media firms including such features as digital rights management, security, and user policy (Informa Telecom 2005). Proprietary standards and walled gardens such as i-mode in Japan and eventually Vodafone Live in the UK became influential during the invention and development phases. This evolution of mobile service delivery platforms, is pictured below (where the Japanese technology system were in an international growth phase by 2003, and the European technology system developed slower):

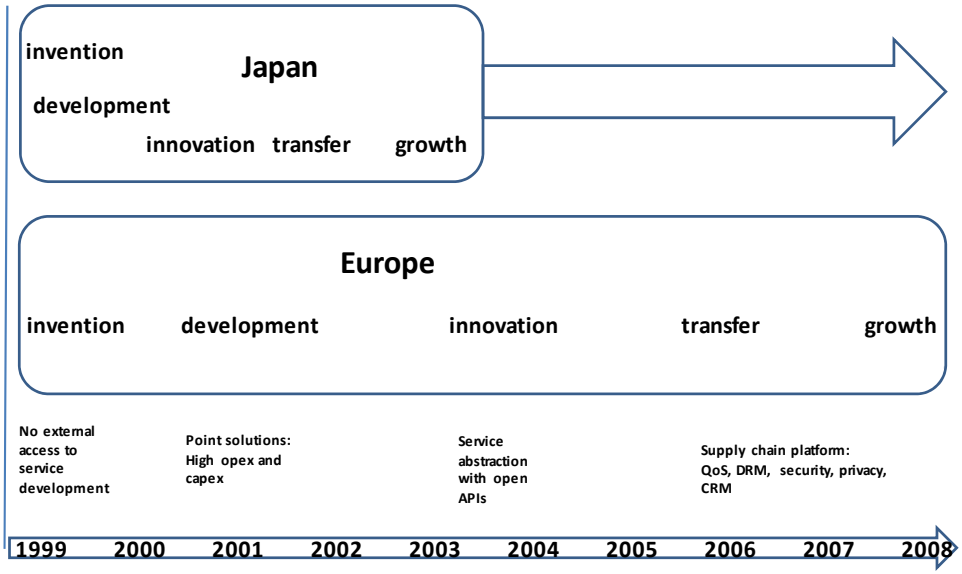

Figure 39: Evolution of the service delivery technology system in Japan and UK 1999 onwards (inspired by Hughes' phases of technology system evolution)

A fine balance has been struck for those who have managed to innovate at the borderlands with their delivery platforms, while maintaining trust with their partners. Only if significant value is offered to all involved, such partnerships will last. And only those firms who continuously innovate are able to maintain such a position. Some would say the i-mode model has provided NTT DoCoMo with a lasting profit engine, but the failure of the introduction of i-mode in Europe was proof that the business system surrounding successful platforms could be difficult to replicate.

Portals: multi-sided markets in Japan and failure in Europe

The Japanese market set out as a coordinated wholesale market characterized by incremental system innovations coordinated by platform sponsors (telecom operators). Europe was a direct sales market with a multitude of providers competing with parallel technology systems, sometimes introducing radical innovations, such as when DoCoMo's i-mode was rolled out by European operators beginning in 2001.

The industry platform in Europe was SMS and controlled by network operators. It remained the messaging and billing format at least until 2005 when users started to surf on their mobile phones. Internet micro billing and email as messaging format solved the start-up problems of the mobile Internet in Japan already in 1999. In both Europe and Japan service delivery platforms in the invention phase were internal, serving the purpose of bridging fragmentation between devices and file formats.

There were differences in positioning between platform sponsors: Japanese operators decided to control through value chain coordination through billing and content approval. European operators got involved in content production in order to directly control the value chain and revenues. NTT DoCoMo in Japan early on achieved an industry platform with its i-mode with most of its revenue from its "bit-pipe" of data supplying the services of its content providers partners. Underlying technologies for delivering and billing on the mobile Internet relied much on standard Internet technology, where a global technology market already existed. However, core elements of such delivery platforms (device discovery, content adaptation, and micro billing) were new variants of Internet technology often spearheaded by dotcom start-ups licensing their technology or providing hosted services for content providers and carriers. Supply chain platforms for early portals in Europe failed in regulating the user experience as Japanese industry platforms achieved. Retail brands (including established media firms) chose to work both with carriers while also establishing their own channels to end-users through billing mediators in Europe. "Off-portal" sites with premium SMS offered more freedom. Japanese operators only allowed billing through their official portals. In Europe portals gradually diminished in importance until some observers talked of a portal death around 2007/2008 (Root 2010). In Japan the portals were still in 2011 an important entry point for users and revenue generators for NTT DoCoMo.

	Carrier	Content Provider	SDP provider	Retail Brands
Japan 2000	Portal mgm, value chain coordination	Carrier biz relations	Systems innovation for CP	Distribute to content provider
EU 2000	Content aggregation	Content creation	Systems innovation for carrier	Distribute to carrier
Japan 2005	Portal mgm, coordinate handset releases	Carrier business relation, cost cutting and volume	Cost cutting for CP	Use carrier portal for revenues, off-portal for customer interaction
EU 2005	Portal management, brand aggregation	SMS for off-portal and WAP for carrier portals	Technology infra for carriers, CP, and brands.	Using off-portal storefronts for revenues

Table 16: Japan/Europe comparison of business strategies 2000 and 2005

Several technology start-ups in Europe emerged as content providers only to realize they better stick to enabling when large brands with vast content portfolios eventually entered the market. Investors in such small enabling firms saw a potential exit route in being acquired by large retail brands or IT and software firms. In Japan an industry platform was established early by i-mode with start-ups focusing mainly on content production. In Europe venture capital spurred a rapid growth of start-ups moving into both content and enabling technologies.

Mobile advertisements: Internet services beating broadcasting

In a first phase (2005-2007) mobile TV advertising became the main currency instead of user fees for Internet service providers, as proven by failed models of subscriptions in Japan and the UK. Mobile TV was seen by many at the time of 3G introductions in Europe and Japan 2005-2007 as a "failure case" that did not deliver any substantial revenues. Carriers in Europe were not interested in investing in new infrastructure before they had seen any pay-back on 3G. Instead, streaming became the preferred channel for users to access video contents, circumventing much of contents provided by broadcasting firms. Technology providers in Japan (such as Access) were betting on mobile TV taking off elsewhere than Europe or the US. They provided "supply-push" hoping demand would follow and saw new export markets open up for the proprietary Japanese mobile TV standard "one-seg" (in South America).

In a second phase (2008-2010) the mobile Internet took off in Europe and mobile broadcasting took off in Japan. In Europe two-sided markets focused on advertisements as major revenue, whereas in Japan a parallel development was seen: DoCoMo and Avex launched "TV for the mobile" service, called BeeTV in 2009, featuring the first large-scale TV productions dedicated to mobile viewers only, with monthly subscription fees as the main revenue driver. The evolution of revenue for mobile TV is summarized below:

Revenue streams Mobile TV among platform providers	**Japan** (operators, ISPs, TV CPs)	**UK** (operators and ISPs)
2005-2007	**"TV in the mobile":** Minor advertisements from broadcasting and data revenues from streaming	**"TV in the mobile":** Negligible revenues from portal fees, data traffic and advertisements
2008-2011	**"TV for the mobile" + Internet streaming:** Sizeable revenues from subscription fees to broadcast services and advertisements from Internet streaming	**Internet streaming:** Minor revenues from data charges and advertisements from Internet streaming

Table 17: Evolution of mobile TV in Japan and the UK 2005-2011

Mobile TV platforms are summarized below in terms of control over the platform and control over customers:

	Control over customers	**No control over customers**
Control over delivery platform	*System integrator platform & content aggregators* BeeTV (Japan), Apple Appstore Google Youtube, Android Markets, Windows Marketplace, Blackberry App World	*Enabler platform (proprietary mobile browsers and media players)* Access, Opera, Adobe Flash
No control over delivery platform	*Content owners* Sky Mobile TV, BBC iPlayer Mobile (iPhone and Android Apps)	*Neutral platform (open source browser)* Mozilla Firefox

Table 18: Categorisation of control over customers and platforms in mobile TV

Comparing with portals during the period 1999-2005, we notice how operators lost control over mobile TV delivery in Europe whereas Japanese operator NTT DoCoMo kept its portal relevant by setting up a joint venture with a TV production company. We also notice how browsers on devices have become more powerful enabling streaming of content, due to 3G networks and capable devices. To enable such features, handsets and browsers in particular were used as part of the service delivery platforms to adapt content (iPhone and Opera to mention two examples).

Mobile commerce: User data as currency in internal platforms

Efficient ticketing sales depend on the knowledge of what users want to buy; the basic principle of any operation matching supply and demand. Therefore, profiling of users and the collection of user data became ever more important in Japan and eventually the UK for mobile ticketing. An important factor for event sales is how often a user interacts and repeatedly purchases. Our case shows that mobile ticketing addresses a main concern among users, namely the ease of buying tickets (Oftel 2005). It was easier to broker this information with a closed platform due to privacy concerns, benefitting operators in Japan, and Apple in Europe, who dominated the market with their walled garden industry platforms. Operators in Japan monetized ticket sales due to strong positioning of their portals, but operators in Europe lost initiative to other players. Apple secured global initiative through an evolutionary approach of attractive services, user interfaces, and circumventing operator billing. In ticketing we saw in part III how user data becomes a currency in an exchange regime along with “time” and fees. In the previous two cases, operator-controlled portal services featured micro billing; and in the second case mobile TV saw a high degree of advertisements as business model. In the third case user data becomes a currency that ticket sellers utilize in order to target users with suitable ticket offers. User data as currency has at least the following implications on the ticketing market:

- Internal reconfiguration: actors with strong Internet communities can bypass the traditional promoter marketing channels (flyers, TV, other less segmented advertising). An issue for a traditional promoter is that potential audiences who have not yet attended any events are not logged (and tagged) in any databases.
- External value chain reconfiguration: New actors with large databases of users (carriers, large retail brands, credit card providers) can strengthen their position.

- User-driven innovation: By making promotion material and fan clubs available on-line users can redistribute and alter the content.
- Increasing user interaction: Firms in the traditional ticketing value network can only monitor and fully benefit from these new user initiated approaches by intensifying their interaction with users (or accessing third party user data bases). This further strengthens the feed-back cycle and the dependence on on-line communities for efficient communication with users for firms.
- Bargaining factors: Customers are on a sliding scale regarding risk aversion (afraid tickets might run out), impatience (limited time), and knowledge (price models and alternative market places). These bargaining factors must be taken into account by ticket distributors and will be different depending on target group and event.

Synthesis: The emerging mobile Internet 1999-2011

Having studied service delivery platforms over time, it has been possible to monitor how interfaces have changed among industries, products, technologies, and firms. Our three-level model of service delivery innovation has enabled us to analyse changes over time in all three cases. This focus on borderlands contributes to our understanding of how business models are dynamic relations among technology, firms, and pricing. The following three synthesis sections will analyse platforms in three ways: as technology components for delivering content; as functions for coordinating delivery value chain; and finally as exchange regimes to determine prices.

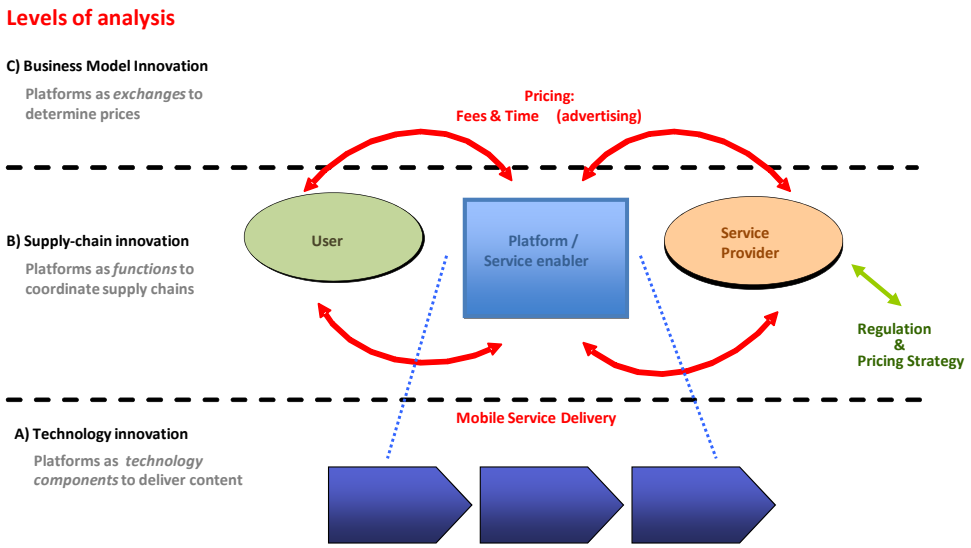

Figure 40: Our analytical model with three levels of innovation

Technology platform innovation

The importance of components used in platforms differed between cases and over the time this study was carried out. Both in Japan and the UK at least device adaptation, delivery and payment have been necessary to deliver both SMS and mobile Internet services. Such "low variety" (Gawer 2008) components that were included in almost all mobile delivery platforms could therefore be considered the "core" components. Other elements of the business models, such as media players or content management systems have been optional components for some, but core services for others. Yet other functions, including advertisements engines, site builders, and third party management have been more "peripheral' (Tushman and Murmann 1998) and could be omitted from the platform core. Some of those peripheral components, such as advertisements engines, have instead been appropriated by Internet services providers such as Google or Yahoo, or in some cases by smaller and focused mobile search firms.

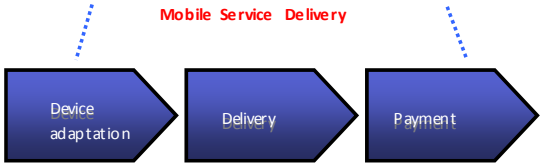

Figure 41: Core elements of a mobile service delivery platform

The underlying technology components (choices) and its usage in Europe and Japan were observed in our cases. We also noted that the general structure of the platform model could be generalised on all our three cases. We observed differences in the usage of certain technology components between Japan and Europe related to technology implementations and the fact that only three similar technology systems existed in Japan (DoCoMo, KDDI, Softbank and predecessors). In Europe a multitude of technology systems existed side-by-side in the form of internal and supply-chain platforms made up of clusters of underlying delivery technologies. The technology choices are outlined below:

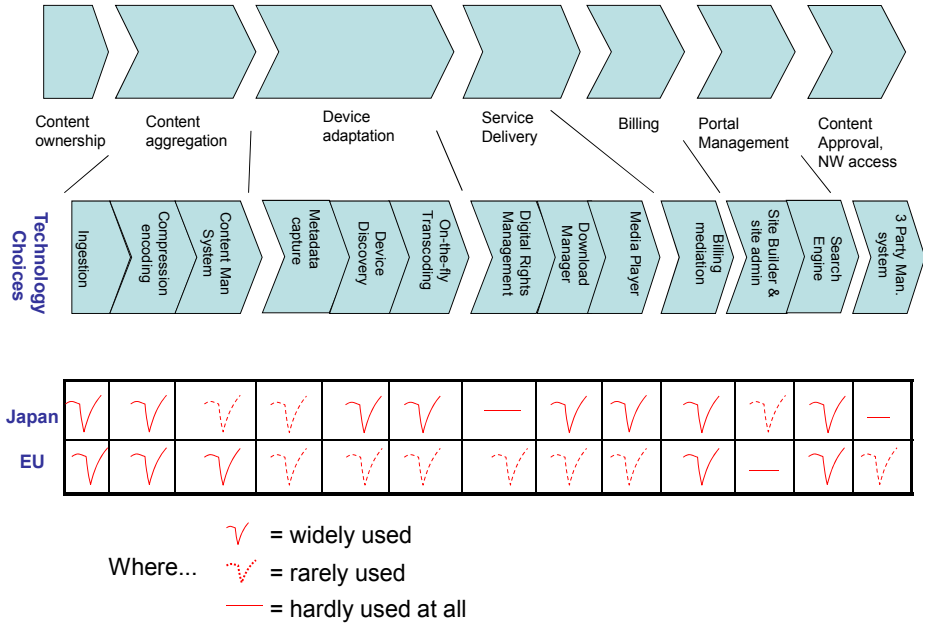

Figure 42: Technology choices for delivery technologies in Japan and UK

We should keep in mind that the above model relates to industry platforms for the mobile Internet. Internal platforms or specialised supply chain platforms could focus on serving one or several of the functions, such as aggregation or billing only. The image below summarises what technology components were included in various types of supply chain and/or internal platforms in Japan and Europe:

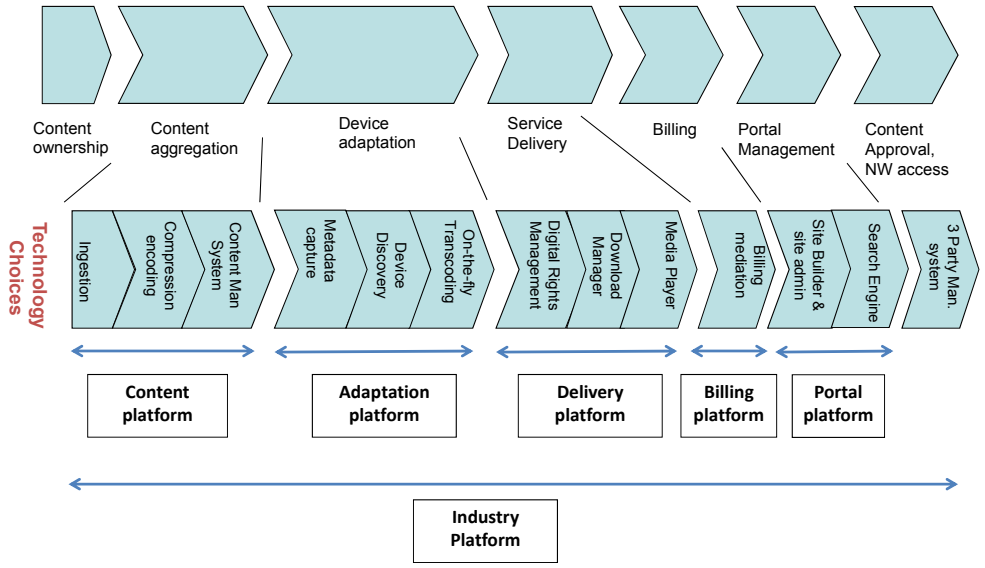

Figure 43: Different types of platforms in mobile service delivery

The picture above aids us in understanding how the introduction of different technology components could be an incremental change for some, whereas it could be radical for others. It could even be said that technological discontinuities assisted new service delivery firms to create competence-enhancing innovation exploiting existing knowledge of internet services. For telecom operators in Europe and the music industry mobile service delivery platforms to some extent functioned as a competence-destroying innovation as these large firms were slow to adapt their organisations (Tushman & Andersson 1986).

Firms migrating their content or distribution to the mobile Internet from off-line (newspapers) or other online channels (PC usage) could experience how core concepts (functions) could be overturned: Device adaptation to mobile screens and formats could be a completely new function of content delivery as Nikkei BP experienced in Japan, who used the SDP provider "Ubit" as delivery platform provider in order to overcome this radical aspect of delivering their content to mobile phones. The first time Nikkei engaged with mobile delivery in 1998-99 it would therefore be a radical move to start ani-mode site as the technology components of device adaptation were overturned compared to desktop browsers. Mobile billing could be an architectural innovation for Nikkei as they had Internet subscriptions for their desktop site, where the underlying components for mobile billing (operator billing) changed compared to desktop billing (credit card billing). It soon becomes obvious that by applying this analysis for different firms, depending on the position and paths of firms regarding mobile Internet

technologies, innovations take on different character. At the launch of the mobile Internet mobile delivery platforms were radical technology systems to almost all firms but start-ups.

The role of defining interfaces and achieving so-called structured dialogue has proven important for firms when expanding an internal platform into a supply chain platform. Further control over interfaces are achieved through standardization and platform leadership through open source (Android, Symbian model), closed OS but open interfaces (Microsoft, Blackberry), completely closed models (Apple) or other walled gardens such as i-mode (Barwell & Packard 2011).

Convergence also affected the delivery platforms themselves that went from internal platforms to supply-chain platforms in Europe spurring an active acquisition market among service delivery players from 2004 onwards. Platform competition broke out between firms who had not been competing directly with each other before, such as KDDI's music service in Japan versus Apple's i-tunes, GPS handsets versus car navigation, and mobile commerce sites in Japan (Index for example) versus established Internet commerce sites.

In line with Suarez and Cusumano's (2008) observations, several enabling firms developed their own service offering in order to finance core platform development. At different points in time different firms have dominated innovative activities. Operators in Japan, and handset makers in Europe took the first step towards standardizing enabling technologies, such as mark-up languages, file formats, and delivery interfaces. Start-ups took the chance in both markets to produce these new services, as established firms lacked the knowledge to adapt their legacy content to the new standards. Eventually well-known brands decided the mobile channel was mature enough and could provide the quality experience they demanded (Disney, for example, did not launch any mobile contents until colour screens were available). Cross pollination between new technology and business models among start-ups came merged with capital, branding, and distribution networks of retail brands. The development and dynamics in the mobile service industry did in some sense follow a traditional cycle of industries beginning vertically integrated due to their small size in order to gradually become populated by specialist firms as they grow. However, it also followed Barras' "reverse product cycle" of improved platform efficiency, improved content quality, from which followed new services due to the

market growing. In a converging industry such paradoxical development took place simultaneously and in different parts of the supply chain.

A market for technology developed early for service delivery components in Europe and less so in Japan. More specifically it was a market for supply chain platforms being combined into delivery of desktop contents to mobiles, as large IT firms developed their mobile solutions towards advertising, content delivery, and billing solutions. Several examples showed how cash-rich US IT and media firms took the chance to enter mobile delivery.

Value chain innovation

The three cases exemplify how firms have taken on different functions in the delivery value chain depending on market characteristics (in Japan and UK), and technological characteristics in respective service (portals, mobile TV, and ticketing).

The initial industry consensus goals around 1999 focused on base technology (networks) and systems development innovation (device support and always-on features). Priorities of carriers and key content providers then gradually changed to efficient roll-out of new services, and building support for service innovations through improved processes and value chain innovation.

European network operators, trying to establish their own platforms, followed the strategy of creating their own services in order to strengthen their portals, without much success. The problem with WAP in Europe with its abundance of internal and supply-chain platforms had more to do with a lack of creating an attractive two-sided market rather than the technology components itself. KDDI in Japan used WAP for its portal and still managed to challenge i-mode in Japan with a user-friendly proposition. Seen from this perspective WAP was only a technical component in KDDI's industry platform in Japan rather than a platform in itself. Japanese operators early on recognised the existing clusters of gaming, music and other entertainment services, and focused instead on billing and the overall quality of their service network. Strategies emerged among operators and SDP providers regarding the *functions* they should take within the emerging value chain of mobile services.

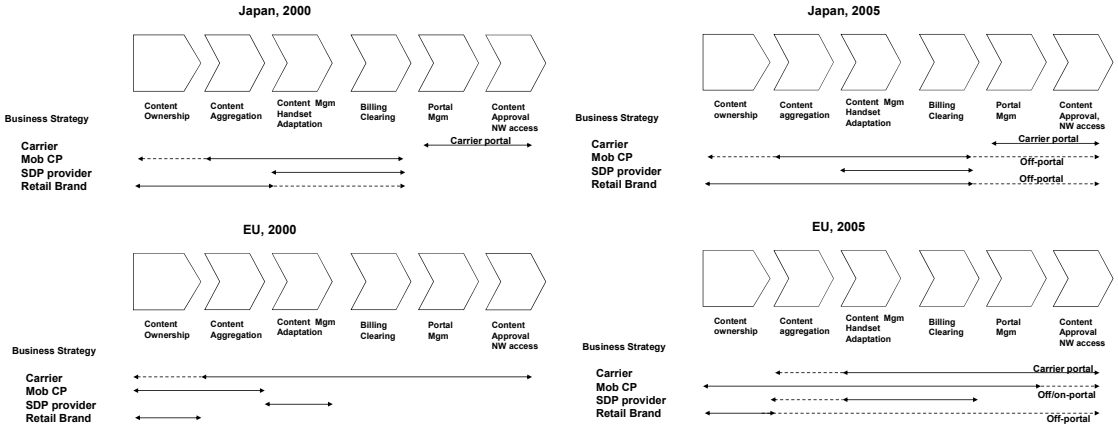

Figure 44: Firm positions in Japan and Europe 2000 and 2005 for entertainment content

Both in Japan and the UK, small technology firms frequently led the way in new mobile services, often to subsequently be acquired by established players once proof of concept had been established. International expansion is difficult for many SMEs, but business as usual for international large firms. Platform enablers soon became business to business middle-men or were acquired gradually by larger IT and solutions firms who moved into mobile service provisioning. The realization that digital services were foremost a delivery innovation was conceived earlier in Japan than in Europe, perhaps due to the focus on incremental innovation with email, newsletters, and portals instead of radical service innovation in Europe with sudden introductions of new technology. Successful services at the dawn of the mobile Internet mostly utilized value appropriation from existing digital media (email, news, music, games, navigation) and only in few cases from radically new content types (such as mobile wallets).

Sponsors of industry platforms innovated with 'robust design' and 'continuous incremental innovation'. European firms often focused on 'novelty' and attempts at 'competence-shifting'. Instead the Japanese market early on developed into an innovative market with a high level of both technological and market novelty ((Tidd et al. 1997).et al.

As Funk's (2001) early research in the Japanese market shows, new services were disruptive to some firms and not to others. Apple built an incremental service system around music for i-pod, desktops and credit card payments before launching the iPhone. The touch-screen user interface was an incremental innovation and not disruptive for users. However, the sudden introduction of a walled garden that worked from day one was disruptive for competitors and developers who

had focused on java applications. It also disrupted the portal model for operators who had to compete with Apple's Appstore.

DoCoMo approached the development of services that had an interdependent architecture with an integrated value chain. Data services required a reinvention of the interfaces between software applications, the handsets, and payment system, which they bundled into what they called the 'i-mode' platform. The strength of network effects decides the structure of coalitions and competition according to (Economides & Skrzypacz 2003). The fact that only three industry platforms developed compared to a myriad in Europe would support stronger network effects in Japan for the mobile Internet.

There is a contrast between our first case of operator portals and the third case of ticketing: When studying how different actors have expanded their influence in the value chain, ticketing went through very little change in comparison. A major reason is that the actual product, the event ticket, remained under the control of ticketing agents. The digitalization of music and games, in contrast, spurred new firms challenging established players.

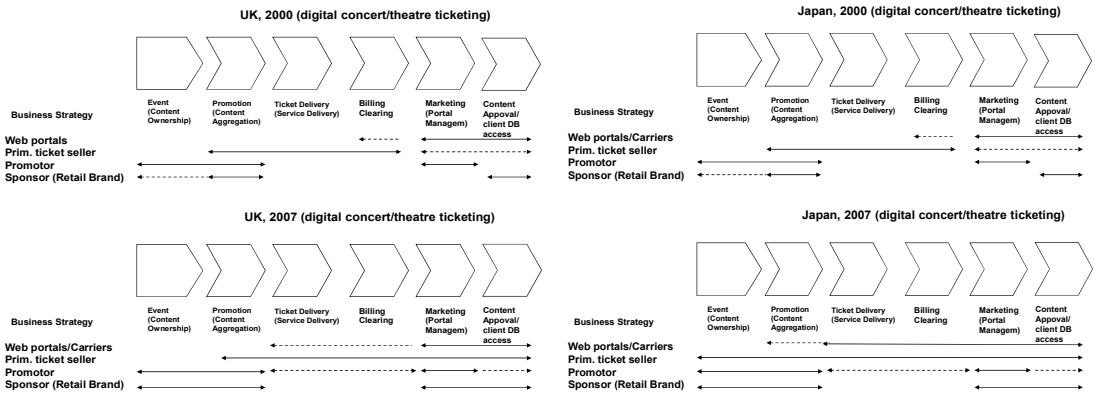

Figure 45: Firm postitions in ticketing 2000 and 2007 in Japan and UK

The first case of operator portals supports Christensen and Raynor's (2002) claim that integrating a value chain does not necessarily require vertical integration. It rather points to Jacobides et al.'s (2006) notion of controlling bottlenecks in order shape industry architecture where controlling the core platform could even inspire to imitation among those producing the complements (services and non-core platform elements). In sense DoCoMo achieved managed

complementarity (Jacobides et al. 2006) in Japan, with both high mobility and high complementarity in the i-mode technology system DoCoMo as a platform sponsor controlled payments and the overall architecture of the revenue and technology. In Europe on the other hand, DoCoMo failed in changing the industry structure (or 'industry architecture' in Jacobides' terms) as shown also by Tee & Gawer (2009). In the case of ticketing, online ticketing firms acquired necessary mobile delivery platforms in order to vertically integrate and take control of the whole value chain, including billing. Operators saw little revenue potential in ticketing as it did not involve micro payments and was difficult to include in the successful subscription model used by carriers there. The role of stakeholders in these two cases developed differently and it cannot be explained only by underlying technologies, but rather with positions, paths and innovation among firms within respective supply chains. The second case of mobile TV saw the broadcasting industry attempting to by-pass operator billing through advertisements, but it was seen initially as a failure case in both Japan and the UK, due to lacking interest from users. Eventually mobile TV got momentum in Japan when DoCoMo launched BeeTV, a channel focusing on "TV for mobile" rather than "TV in the mobile".

Successful SDP firms managed to analyse the market for mobile services and found means to expand their knowledge beyond the boundary of their own firm mostly through acquisitions and strategic partnerships with operators. Several of our interviewees deemed in-house R&D and organic growth as not sufficient to grow in this fast-growing market from 2005 onwards. It became critical to achieve 'structured dialogue' (Christensen et al. 2002) between interfaces of acquired and in-house technology components in order to grow the business. Our cases showed that firms with mostly interdependent interfaces favour vertical integration but will be vulnerable when others achieve functional separation, such as when music publishers were overtaken by karaoke firms in Japan (for the delivery of ringtones rather than full tracks), or broadcast firms in Europe lost initiative to Internet service providers (media players on mobile phones receiving streamed Internet rather than broadcast signals). Decisions stemming from functional separation or vertical integration lead to strategies for focus or diversification across a value chain.

Industry platforms support innovation in complementary services and components (Gawer 2009). Some content providers in our cases focused their service creation specifically on one industry

platform (such as Giga Networks in Japan focusing only on i-mode). Several of the successful content providers/enablers in Japan expanded to Europe and one company we interviewed hosted portals for a major European operator. It therefore ended up supporting two parallel technology systems, where especially sprawling handset standards made device adaptation a bottleneck in delivering services in Europe in 2005-2006[95]. Diversification and focus strategies relate to such decisions about scale and scope, expanding or withdrawing (the company interviewed, Ubit, eventually withdrew from the European market). One consideration is what platform-type a firm is striving for: focused (internal or supply-chain platforms) or diversified (supply-chain or industry platforms). Supply-chain platforms are not always part of two-sided markets, instead they often reside within two defined interfaces and charge only one customer for services.

Industry convergence had created enough momentum in the mobile Internet technology system for Apple and Google to eventually launch their respective platforms: the i-Phone/Appstore platform, and the Android platform. Apple's i-phone utilized a portal model with 30% share of content revenues kept by Apple (compared to 9% for DoCoMo), whereas Android is a platform sponsor monetizing advertisements through user data and behavioural advertising. In this sense Apple and Android exist side-by-side with operator portals in Japan, but in Europe these two industry platforms have replaced the supply-chain operator portals as the main revenue zones for content. Increasingly mobile Internet platforms connected firms and users in similar ways as on the desktop Internet:

Buyers	**Platform**	**Sellers**
TV Viewers	Handsets / operators portals	Broadcasters (Pay TV)
Gamers	operators portals / game portals	Game developers
"eyeballs"	Off-portals	Advertisers

Table 19: Buyers and sellers connected on mobile Internet platforms

A platform that manages to charge both its suppliers and customers has created a two-sided market (Evans 2003). The two dominating billing currencies have been fees and advertisements

[95] Interview Ubit, 2008

on the mobile Internet, and we note some basic differences in such two-sided markets. Below is a one way to illustrate delivery platform functions and components:

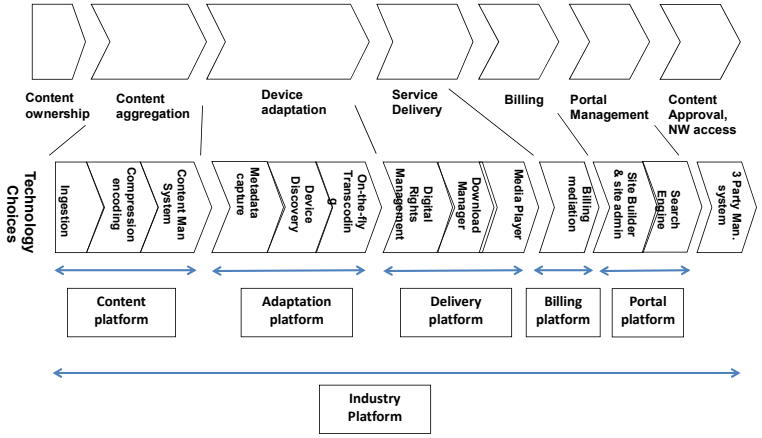

Figure 46: Different types of platforms in mobile service delivery

Let us compare the most influential platforms during the 2000s controlled by DoCoMo and Apple with that sponsored by Google:

	Industry platform owner (DoCoMo, Apple)	**Industry platform sponsor (Google)**
2SM Characteristics	User interfaces (C); only one portal;	User interfaces (P); multiple versions of portal; advertisements (C);
Functions controlled in value chain Controlled (C) Sponsored (S) Partner controlled (P)	Content aggregation (C), service delivery (Apple C; DoCoMo P); billing (C), portal management (C), content approval (C)	Content aggregation (S,P), service delivery (P); billing (C, P), portal management (C), content approval (S,P) (Chu & Dougherty 2011)
Content provider's market power	Controlled partly by owner through content approval and secondly by bargaining with large CPs	Decided mainly by users as content providers can publish as many applications they want; secondly by portal management (policy decided by Google)
Role of lead users	Only apple customers can access the portal	All Android phones from multiple manufacturers can access the portal
Effect of multi-homing	None (few users have 2 phones)	Operators and Android Markets cannot deviate with pricing

Figure 47: Comparison of two-sided market characteristics between platform owners and sponsors

Business model innovation

When viewing platforms as an exchange, the purpose for firms is to monetise user data and transforms advertisements into cash flows (fees) in a multi-sided market. The exception would be actors who are not-for-profit or provide other public goods. The cases show how Internet traffic and user activity gradually shifted from the walled gardens of operator controlled portals onto the open Internet. In order to effectively place advertisements and to be able to target users with ticket offers, our cases show how user data was increasingly gathered by service providers. The three currencies could be summarised in the following:

- Fees: Telecom operators and service providers through portals and messaging. Requires flexible billing systems and a strong subscription base.
- Advertisements: New entrants and Internet service providers using the mobile Internet for placing adverts accessible on mobile devices. This model demands access to audiences.
- User data: User data is an intermediate input for fees or advertisements in the application layer. However, it is also used for traffic optimisation by operators and service providers.

In addition to these three "base currencies" loyalty point systems and other virtual currencies have been used by firms. Value chain coordination would allow such currency systems to expand their boundary until exchange costs for fees, advertisements, and user data make it uneconomical. An overarching boundary condition is regulatory influence (for example privacy and data protection, or advertisements guidelines). By enrolling more buyers and sellers to the platform, network effects enable the platform to subsidize those sides of the market that would drive up total revenues. The picture below shows potential sell-side partners for a mobile service delivery platform, and as long as network effects can be increased, it is economical to expand the boundary of the exchange.

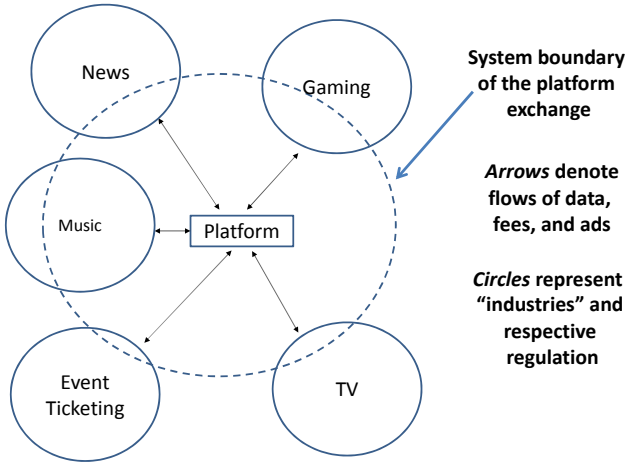

Figure 48: System boundary of a platform exchange; inclusion from different industries

Such an exchange view can explain how acquisition or collaboration with other platforms affects the economics of operations. In our cases we have seen how mobile service delivery platforms have extended business systems when technology innovation and supply chain coordination have connected industries with each other. New business models could be enabled by such extensions, and the platform would influence currency exchanges within its boundaries: it becomes an "exchange regime". By adding access to additional buy (users) and sell side (content providers) assets, new multisided markets are created. Such exchange regimes could therefore influence the industry structure. Our cases show how firms are hesitant to share collected user data: Not only is it often core business intelligence and considered as trade secrets, there are reputational risks associated with disclosing private data. Privacy and data protection regulation makes it illegal in some cases to engage in commercial exchanges of data. As a result firms favour

internal platforms when utilising user data for advertising placement rather than using it as an open currency. Firms engaged in advertisements-based revenue models therefore monetise user data mainly through their own internal platforms. Consequently, vertical and horizontal swings in an industry could be affected by what structure (focused or integrated) of the value chain is furthered by an expanding exchange regime.

From our TV case we saw how operator-controlled portal business models did not suit advertisements-driven TV broadcasters and Internet service providers. Traffic growth for TV took place instead "off-portal" among 3G users with unlimited data subscription. Streamed video became the main traffic driver on the 3G networks both in Japan and Europe, as it has been on the Internet as a whole (Cisco 2011). Not until 2010 when video on smartphones consumed large quantities of data, were the unlimited data bundles questioned and eventually replaced by a return to tiered data pricing in the UK (HSBC 2010) and Japan. Volume pricing on data is also a return to DoCoMo's original i-mode business model. When users have to pay for data traffic; it follows that service providers have to rethink how efficient their services are in decreasing bandwidth utilization when operators change from unlimited data packages.

Several interviewees discussed the difference between "old" (print) and "new" (Internet) media[96]. Desktop Internet firms have long had problems replicating the combined subscription fee and ad business model of the print industry, most of them applying only online advertisements models. Established players with strong brands have in some cases been able to apply a fee structure on-line, but digitalisation has increased the divide between what is perceived as high quality by users[97]. Japanese manga and anime content holders have been restrictive in diluting their brand; hence they only granted access to their content through fees. Search and social networking providers all apply the business model of user data and behavioural advertisements. In general users are more willing to pay for content on the mobile Internet compared to the desktop Internet.

[96] Interview Peter Arvai for example, 2008

[97] Financial Times and New York Times both moved to a "freemium" model in 2010, with full access to content only for paying customers

When acting as exchange regimes, platforms serve as rule-making governance mechanisms as pointed out by Boudreau and Hagiu (2008). One such mechanism in coordinating exchange between users and service providers are service contracts. Portals are an example of automation tools addressing contract incompleteness and created a transaction-like environment minimising human interaction. Service contracts regulate delivery under certain conditions: price, service, and delivery technology. Below is a summary of how service delivery platforms have addressed contracting issues on the mobile Internet:

Structure of interactions	**Complete contracts**	**Incomplete contracts**	**Mediation effort by supply- and industry platforms**
Duration	One shot	Contingent renewal	Mixed: Subscription-based set price or one shot
Offers	Public	Private	Public buy-price, private supply-price
Price determination	Haggling, offers rejected	Price setting by short sider	Two-sided market, subsidized
Market networks	Many weak links	Bilateral trading islands	Two-sided platform-based

Figure 49: Contracts mediated by platforms; adapted from (Brown et al. 2004) and (Bowles 2004)

The table is explained in the following:

Contract duration: Monthly subscriptions are used to overcome the issue of contingent renewal. Apple and Google later standardised their portals and focused on one shot sales of applications rather than subscriptions.

Offers and prices: By introducing public prices on portals, content providers adjusted their services so that platforms established a link between expectation among users and demands on quality from the supply-side. Successful contents enjoyed increased prices on i-mode or determined their own price on AppStore and AndroidMarket.

The relation between supply- and demand side is mediated by the platform, but still resembles a relation of trust, as the expectation of the experience ultimately is a continuous relationship between users and content providers, regulated by the platform.

Market networks: Initially bilateral trading islands in Japan as most users bought contents from their operator on its portal; many weak links in Europe due to premium SMS linked to multiple smaller providers. Standardisation of the user experience was still possible off-portal in Europe as main contents were ring signals, music and graphics. More complex contents like games experienced more success in the Japanese environment, where quality was strictly regulated by operator platforms.

Continuous renewal of contracts only takes place if customers trust the service provider based on previous experiences. Another challenge when offering services is that "experience goods" are perceived differently among customer groups. Efforts by platforms to manage expectations of quality included bringing in well-known brands. Monthly meetings with content providers in Tokyo and personal contacts made sure that reputational risks did not threaten. Eventually, as i-mode became an interconnecting platform between suppliers, these rules turned into accepted business practice and a self-regulating environment of social behaviour, as the community as a whole might suffer reputational risk if even a single company would misbehave. In a growing market such community feelings among firms can be established more easily than in a stagnant market due to common industry bodies promoting joint interests, such as the Mobile Contents Forum in Tokyo or Mobile Monday across several of the world's cities.

The platform markets and conditions for business models were different in the more closed and national context of Japan compared to the international environment in Europe. In Japan new devices and technology were released at regular intervals. The effect on innovation with such stable platforms could be negative if it takes on a monopolistic character. It does not seem to be the case though in Japan even if DoCoMo has had more than 50 percent of the market since i-mode's introduction in 1999. The high rate of innovation among operator walled gardens in Japan has instead impressed the world of telecoms. Several important technologies and services have been pioneered in Japan: colour screens, picture messaging, java applications, 3G networks, full-track music, QR codes, mobile wallets, and mobile commerce, to mention a few. The

disadvantage for the Japanese has been a relatively closed environment for competing payment systems (only operator portals can be charged to the mobile bill) and a lack of integration between desktop and mobile platforms. Certain niches have also suffered, such as initial incompatibility with GSM and no access to prepaid SIM cards. In this sense benefits and disadvantages could be identified in a relatively closed technology system such as Japan, compared to more open and international systems in Europe. Closed systems have the benefit of less alignment needed among stakeholders, initial speed, and opportunity to reach network effects for suppliers due to limited platform choice among users. We compare strategies for platform openness in the table below:

	Japan (national and "closed" market)	**Europe** (international and "open" market)
Restrictions on participation	Several restrictions. The operators act as gateways for other innovators restricting some business models; End users cannot switch operator and keep their device; CPs can only charge to the mobile bill in operator portals	Few restrictions. New innovators even compete with operators as MVNOs (mobile virtual network operators), such as Virgin Mobile in the UK; End users can keep their device and switch operator; CPs can charge to the mobile bill for services off-portal, such as TV voting
Vertical strategies	Platform exclusivity per operator in the national context; Operators have national exclusive categories in their portals and file formats; Absorption of complements for services (examples include music and TV contents).	Platform exclusivity per handset maker in an international context; Apple, Blackberry, Nokia have a global exclusive content categories; Android has a global platform it sponsors with open participation; Platforms compete with various degrees of absorbing complements.
Horizontal strategies	No technical interoperability for most hardware and services between operators; Joint standards exist for mobile wallets and messaging (email); A national market for technology and content licensing has developed	Full range of technical interoperability often with global standards or distribution in mind; Several joint and incompatible standards exist side by side; An international market for technology and content licensing has

		developed

Table 20: Strategies in open and closed markets; inspired by (Eisenmann et al. 2009)

Conclusions

Even though similar Internet technologies were available in Japan and the UK, very different markets for services developed during the initial years. When observers in the West expected Japanese firms to become dominant players in the mobile digitalisation of services during the introduction of 3G networks, it remained instead a national affair after the failure of i-mode in Europe. The dominant views of how markets for mobile services functioned seemed flawed.

We have shown how delivery platforms were used to connect mobile phones with service contents that were often adapted from the PC world, such as email, downloading of music, and access to news. We have also shown how the mobile phone gave birth to new services and use cases. Through our three cases we have shown how firms can use content delivery platforms to support innovative services and technology. Designing and operating service delivery platforms became first a new niche market dominated by technology start-ups, and increasingly established firms as business opportunities expanded. In order to analyse service delivery platforms we have identified the enabling technologies and how they were deployed in platforms. The importance of various technology components for the creation of services have therefore been explained throughout the cases.

By connecting the technology components to functions carried out by firms in a value chain (or network) we have analysed how firms have positioned themselves to benefit from mobile delivery platforms and services. Since we have studied these dynamic relations between firms during 1999 to 2011, there is ample evidence of how innovation has taken place by different types of firms. We have devoted particular focus to how new technology and services have been developed by start-ups and how they have either grown or being acquired by others. As the thesis is an historic account of an emerging industry, the relationship between start-ups and established firms has been a dynamic one, and we have structured and theorized our comparison of the cases and the two markets in order to generalize our findings.

The role of platforms in connecting two-sided markets has been generalized into the study of fees, advertisements, and user data (currencies) in the three cases. Implications on platform design by the choice of currency and how platforms have enabled multi-sided markets are among

the themes explored. Especially the role and process of how new industries have been connected to mobile platforms have been studied. We conclude that innovation in the digitalised economy is largely influenced by firms achieving platform leadership who act as regulators for a value chain or a whole industry. Such leadership is enabled through coordination of both technological systems and the creation of multi-sided exchanges. Our model of platforms enabling multi-sided markets and acting as currency exchanges explain how certain products are free or hold a certain price in certain markets and how it can change over time. Institutional forces such as regulation or standards are one explanation why such choices among firms are different in different markets and industries. Other explanations relate to corporate strategy or the market conditions described by our model, which can assist in identifying new business models to support service delivery platform innovation. This investigation has been used to explain positions and paths especially among firms in the industries of mobile music, TV, and event ticketing.

This thesis demonstrates from our cases of two-sided markets in Japan and the UK that defining the scope of the firm, i.e. what activities a firm engages in, on the network level forms the basis for incremental innovation, the dominant form of service innovation. A parallel focus on coordinating platform technology choices forms the basis for firms to trade fees, advertisements, and user data, enabling control over profitable parts of multi-sided value networks. As discussed in the section on mobile TV technical aspects of platform delivery in Europe and Japan were similar, but close links between different industry platforms were hampered by different views on pricing. As pricing is an interpretation of value it could be said that the focus on value creation was different in Japan and Europe, that we have shown partly being due to different industry structures (or “architectures” as noted by Jacobides et al., 2006).

Innovation at the borderlands was introduced in our literature review on business models as a collective set of concepts describing structured relationships that are contained and not completely open. There is a long-standing debate on the role of open standards in policy setting where consumer groups (see e.g. Hammerstein 2011) and other lobby organizations are involved. This thesis contributes to this dialogue on “open and closed” models as value on the mobile Internet can be shown to have been created in various forms. We have shown that many bottlenecks crucial to controlled mobile service delivery have not been open standards. On the contrary, two of the most successful industry platforms have been walled gardens: i-mode and

Apple's i-phone. Even long periods of forum activity around industry standardization in the WAP Forum provide little proof of long-term benefits for the development of the mobile Internet. Even within WAP Forum leading firms launched proprietary standards ahead of WAP publishing their open standards. Even Android cannot be seen as completely open, as the specifications are developed by one firm and the Android Market is controlled by the same firm. It therefore keeps certain features intrinsically connected to its own IP. Instead, the openness we have seen in the cases resembles open interfaces often connecting peripheral elements regulated by a platform sponsor (or owner) controlling a proprietary core in its platform. The resulting dominant delivery platform designs for the mobile Internet therefore emerged through industry consolidation and convergence rather than deliberate consortia-driven standardization from within the telecom industry itself.

SMS, however, is the single best example of a successful collaborative effort for platform design among European operators and handset makers. Cross-carrier acceptance of SMS in Europe has provided large profit margins. This insight helps us to understand better the means by which SMS became the critical factor in the dissemination of European mobile Internet services.

During 1999 to 2011 mobile services have gone from being an isolated value chain for proprietary contents to becoming a driving force for the digitalization of the economy. Japan and Europe have been connected through access to the same or a similar network infrastructure. However, in terms of content, delivery systems, and business systems they were completely separate. Our study clearly shows how technologies in two markets compare and contrast and our analysis assists in understanding how business models and distribution networks assist in the commercial success of how technology systems develop. Through this analysis we go beyond cultural elements that are so often used to dismiss lessons of innovation from Japan.

An important aspect of a structural change as when a new industry emerges is the speed in which it transforms. Platforms could be seen as taking on various degrees of institutional features as they have regulatory capabilities: standards for technology components, coordination of value-chains, and forms of payment in two-sided markets. Firms often struggle to estimate the time it takes to change, implement, and disseminate a new standard. The history of the emerging mobile Internet provide cases of "open" standards coordinated in standard forums, proprietary

standards such as those deployed in so-called walled gardens controlled by one firm, and platforms sponsored by visionary firms.

In Europe our observations indicate the mobile application layer is increasingly in the hands of technology firms rather than telecom operators. In Japan telecom operators have established industry platforms through which they have regulated continuous service innovation throughout the period of study. The thesis analyses service innovation on three levels to show these patterns, paths, and positions in Japan and the UK: technology, supply-chain and business models.

Operators in Japan and handset makers in Europe took the first step towards standardizing enabling technologies, such as mark-up languages, file formats, and delivery interfaces. Start-ups took the chance in both markets to produce these new services, as established firms initially lacked the knowledge to adapt their legacy content to the new standards.

The build-up towards the growth and consolidation of industry platforms in Europe from 2007 onwards was achieved by several years of addressing the main reverse salient (a concept close to 'bottlenecks' in Jacobides' terms)in the mobile Internet technology system: mobile service delivery platforms. Comparing Europe and the UK with Japan we see an exploration phase with different approaches involving disruptive technologies beginning in 1999, to a phase of differentiation of technology and business strategies, then back to a convergence of technology where effects of coordination costs affect the reordering of the value chain in 2005 and where common themes of business strategy emerge in both markets. Technical differentiation became less important at this growth stage, i.e. commercial aspects of content editing and retailing took over while the core functionalities of the platform were stabilized. Building partnerships in order to create supply-chain platforms become important in the eyes of business customers, such as telecom operators in Europe. To be seen as viable partners for large firms, SDP providers had to make decisions on scale and scope: to be acquired as a technology component or attempt at expanding the business and build a supply-chain platform. As financial strength, not only technical innovation, became a prerequisite for bidding on large projects and collaborating with multinational firms in the supply-chain platform scenario, many SDP entrepreneurs chose to continue to focus on technology development and to be acquired, rather than focus on distribution and wholesaling of content.

Thereby a convergence between smaller firms and larger firms within the mobile industry took place. Several SDP providers were acquired by large IT and desktop software firms, providing industry convergence between, for example, telecom operators and ticket vendors, handset makers and game producers. With the introduction of the mobile Internet an extensive global force for technology convergence took its beginning. Many content providers struggled to deliver content for a sprawling set of standards among European operators. This spurred many of these content providers, often start-ups, to develop their own internal platforms.

Whereas the Japanese mobile Internet technology system lead the way in service innovation from 1999, the gap narrowed after 2008 with the introduction of Apple's and Google's industry platforms which enabled an increasing convergence between desktop content and mobile devices. Japan has been surprisingly weak in producing global software and Internet firms. Growth has been limited mainly to the Japanese market and some observers speak of a "Galapagos effect"[98] relating to an isolated market taking on its own form. The operator-centric Japanese Internet market restricted cross-platform products not controlled by telecom operators. Examples of such innovative services from outside Japan that have developed into platforms for both desktop and mobile usage include i-tunes, Facebook, Skype, Dropbox (a cloud storage service), and Spotify (music streaming).

It could be argued that mobile services have been at the forefront of utilizing outsourcing, virtualization, and in recent years so-called cloud computing. Flexible storage and connectivity infrastructure have been crucial to provision services for hundreds of different types of handsets. Large variations in mobile usage depending on the time of the day and popularity of services, combined with limited bandwidth spurred service providers to increasingly monitor and profile their users from 1999 onwards. The increasing collection of user data not only threatens privacy of users in case of breaches, but also poses a reputational risk for service providers, as users could become reluctant to use new services due to these privacy concerns. Business models using behavioural advertising have to strike a fine balance between offering useful services

[98] Inspired by Charles Darwin's visit to the Galapagos Islands in the 1830s, where isolated breeds of birds were believed to have formed new species.

without compromising privacy when placing ads based on user profiles. These are, of course, topics for further research that will benefit from the conceptualization put forward in this thesis.

In the mobile Internet industry disruptions, such as when billing changed from operator monopoly to bank payments, have often been driven by services. Only attractive services appreciated by end-users have had the strong impact to change the demand-side of multi-sided markets in music, streaming, or commerce (ticketing). The open source community has gradually become involved in mobile service applications as Google released Android.

In Japan, no dominant operating system emerged, as competition towards customers was focusing on the operators and their launches. Service delivery platform technology was also controlled by the operators since they kept the monopoly of billing capability. Due to strong control from carriers this situation prevailed through all our three cases. Only with the introduction of the near field communication system Felica, one carrier (NTT DoCoMo) managed to establish a cross-carrier standard, supported by an equipment manufacturer (Sony, who rolled out payment terminals in shops) and railway operators (Japan Railways, who provided the first attractive application). This, too, is a topic for further analysis that will explore other forms of platform business models[99].

From our cases we see a higher level of structured dialogue in 2008 where technology standardization and value chain coordination are two elements, compared to 1999. That led to some firms being able to control complete supply-chain (such as ticketing) or even industry business systems in 2008 which was not possible in 1999. The introduction of mobility and mobile commerce have in many cases changed the relative negotiation position between suppliers and customers, such as the price on time-sensitive products (such as for event tickets).

[99] In order for innovators to not lose out to imitators, complementary assets (Teece 1986) could be bolted onto core technologies assisting in expanding an internal platform into a supply chain platform. The complexity of developing complementary assets at the same time as core technologies is a reason why many service delivery start-ups were later acquired by established firms. This dynamic aspect of innovation is therefore further explanation for technology convergence.

This thesis has focused on the dynamic and innovative process whereby platforms are *created* (and markets with them). It thereby addresses a gap in the literature alongside scholars in the platform school referenced throughout the thesis [100] since most previous research has been limited to the ways existing platforms facilitate exchange through pricing in a multisided market.

The structures and dynamic relations described in the thesis will continue to dominate the industry for some time to come as new business models emerge to offer new services and to monetize opportunities that are as yet poorly exploited. Our analysis will not only shed light on those activities, it will also show how the current trends emerged and help to understand many features of the innovations we have yet to imagine.

[100] Amongst others Gawer & Cusumano (2002), Boudreau & Hagiu (2009), and Cusumano & Suarez (2009)

Appendices

I - References

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II – Interview template

I want to ask you some questions about your work as product manager and especially as it relates to matters of service innovations in portals, mobile TV, and ticketing ("services"). My questions are organized in the following way:

- First I will ask about your position and responsibilities within your company.
- Secondly I will ask about current and previous offering/enabling of mobile services
- Then I will ask about your relations with external bodies such as regulators and industry and professional organizations.
- Finally I will ask about the structure of corporate ownership and partnerships affecting cross-industry networks and service innovation in general.

I want to assure you that I am not interested in any proprietary or commercially sensitive information. I am not going to ask you about details of your roadmaps or products under development or sensitive client information. The information gathered will be made anonymised and used for research purposes.

A Who is responsible for (product/service development) innovation in your company and what processes are used?

A1	Who is ultimately responsible for the product development/innovation in the company?
A2	Please describe the reporting structure for improvements and changes to product development?
A3	Who do you see as the main stakeholders in product development and innovative activities? What are their expectations of you?
A4	How would you present an argument to superiors for changes in product development or other service development, for example if you wished to increase expenditure or resourcing?
A5	Do you perceive expectations and willingness to provide resources changing?
A6	To what extent have you used external resources and partners in the past?

A7	Is the role of the innovation management managers/executive moving towards routine, commodified practices, or towards directors' level strategic functioning?

B Current and previous participation or enabling of Services (as indicator for industry innovation)

B1	Could you describe the types of Services you've offered in the past up to now?
B2	Which of these have been commercially and/or from usage view most successful?
B3	To what extent has SMS or email been part of the functionality of these services?
B4	What operators or other partners have you worked with?
B5	Has there been any mobile-to-PC or vice versa elements of the service?
B6	How do you see email vs SMS becoming increasingly important for your service portfolio?
B7	How have the billing and pricing models changed over time for your services?
B8	Can you share information regarding sales and profit levels for these services in the past?
B9	Can you see convergence between the "mobile" Internet and the PC oriented Internet, and how does it affect your business?

C Regulation, standards and best practices (email, SMS, payment models over time)?

C1	What regulation and legislation has the greatest impact on your services?
C2	How do you deal with government regulators?
C3	Has regulation greatly impacted your business decisions in the past, if so which aspects?
C4	What aspects of regulation is stifling innovation, in your opinion?
C5	What technical standards affect your development work most?
C6	Are you involved in developing any technical standards of your own?

D How is the structure of corporate ownership affecting cross-industry networks and service innovation?

D1	What assessments are made of the firm's innovative assets and its development? What methodology is used for this?

D2	What structural deals, mergers, or new entrants have impacted your competitive position in the past?
D3	Has the company been through any merger/acquisitions from 1999 onwards and how did it affect the product portfolio?
D4	How are innovative capabilities valued in merger and acquisition situations?

III - Interviews

Interviews and seminars, Japan

Access, Mr Andre Demarque, Oct 07	Recorded	Handset capability, services
DoCoMo, Mr Nakamura, Feb 08	Notes	Operators and portals
DoCoMo, Mr Mizunoya, Oct 07	CEATEC, 3GSM, notes	TV, music, operator offerings
DoCoMo, Mr Kanno, Feb 11	Notes	Service innovation, NFC
Dwango, Mr Kawakami, Oct 2003	Notes	Games
E-plus, Mr Schmidt Oct 07	Notes	Ticketing
Ericsson, Mr Burman, July 05	Notes	Billing in Europe-Japan
Ericsson, Mr Ohtsuka and team, May07	Recorded	Japan
Eurotechnology, Mr Fasol, May 07	Notes	Japan and EU comparison
FT, Mr Turner, May 07	Notes, background interview	Japan and EU comparison
Giga Networks, MD, Oct 2003	Notes	Ringtones
Increment P, Mr Nozaki, Oct 2003	Notes	Navigation, services
Index, Mr Terada, Oct 07	Notes	New services
Index, Mr Oda, Oct 03	Notes	Mobile commerce
KDDI, Ms Fujitsuka, Oct 07	CEATEC 07, notes	TV, music, operator offerings
MC Forum, Mr Kishihara, Oct 07	Notes	Japan's service landscape
Nikkei Net, Mr Kabaya, May 07	Recorded	Media's transformation
Nokia, Mr McKenzie, May 07	Notes	Service, mobile TV
NTVP, Mr Mori, May 07	Notes, presentation material	VC, mobile TV
Rakuten, Mr Miyazawa, Oct 07	Recorded	Ticketing, commerce
Sega, Ms Inui, Oct 2003	Notes	Games
Sky Group, Mr Koshiishi, Oct 07	Notes	Handsets, software, services
Swedish Science Office, Mr Naito,May 07	Background interview, Notes	Japan's telecom innovations
Texas Instruments, Mr Mine, May 07	Recorded	Long-term trends - hw/services
Ticket Lawson, Ms Yong, Oct 2007	Telephone interview	Ticketing
Tsutaya Online, Mr Nakamura, Oct 07	Notes	Ticketing, social networking
Ubit, May 07, Mr Onuma	Notes, presentation material	SDPs
Ubit, Mr van Blokland, Oct 2003	Notes	Portals, SDPs
Ubit, Oct 07, Mr Onuma	Notes	SDPs
UBS, Mr Makio Inui, Oct 07	Notes	Stats on Japanese market
Yuichi Kogure, Researcher, Oct 07	Notes	Trends in Japan vs Europe

Interviews and seminars, UK

A1 New Media, Apr 06	Notes	Mobile search
Access, Mr Lemarque, Feb 08	Notes	Browsers, services
Blyk, Mr Morley, June 09	Recorded, PPT	Advertisements, MVNO
BT, Mr Karim, July 08	Notes	New fixed line services
Ericsson IPX, Fredrik Neumann, 2010	Notes	EU service development
Ericsson, Mr Hjort, Feb 07	Recorded	Mobile TV
GE Finance, Ms Göttinger, 2007	Notes (confidential)	Ticketing
IBM, Mr Lozinski, July 09	Notes	New services
Intec, Mr Visconte, Feb 08	Notes	SDP, Payments
Itochu, Mr Yamada, Mar 07	Notes, business cases	Migrating business models
Last second tickets, Mr Massey, 07-08	Notes, research material	Ticketing
Minnick, Ms Nilsson, May 07	Recorded	Services
Mobile entert Forum, Mr Suhail Bhat, Feb 07	Recorded	Services
Nokia Siemens Nw, Mr Wiklund	Notes	Mobile TV
Ofcom, Mr Blowers, July 08	Notes	Regulation
Oracle, Mr Durbin, Feb 09	Notes	SNS, payments
Orange, Mr Tazi-Cherti, May 08	workshop, presentation	converging services in UK
Orange, July 09 (confidential)	Notes	UK services strategies
Mobile Professional, Mr Arvai, June 08	Notes	Mobile media
QPass, Mr Jefferies, Feb 08	Notes	Payments, billing
Sony/Shozu, Mr David Lipp, June 08	Notes, PPT	film media and mobile
T-Mobile US, Mr Jordan, June 07	Recorded	Innovation work in operators
Upstream, Ms Jane Henry, Feb 2011	Notes	mobile advertisements
Virgin, Mr Berry, July 08	Notes, PPT(confidential)	New service development
Vodafone, Mr Hooft, July 09	Recorded, PPT	International regulation
Wmode, Ms Bereski, Feb 07	Recorded	Payments
Yospace, Mr Springall 07	Notes	UK services, payments
Yospace, Mr Springall 11	Notes	Mobile video