IT and Telecoms Convergence:
Mobile Service Delivery in the EU and Japan

Authors:
Patrik Kärrberg
Doctoral student at Department of Information Systems,
London School of Economics and Political Science
Houghton Street, London WC2A 2AE
Tel: +44-78 9631 7814
Fax: +44 (0)20 7955 7385
e-mail: p.a.karrberg@lse.ac.uk
(contact author)

Jonathan Liebenau
Senior Lecturer, Department of Information Systems
London School of Economics and Political Science
Houghton Street, London WC2A 2AE
Tel: +44 (0)20 7955 7338
Fax: +44 (0)20 7955 7385
e-mail: j.m.liebenau@lse.ac.uk

Abstract:
We will show in this paper how the process of delivering mobile content to handsets has changed from proprietary delivery mechanisms towards components making up delivery platforms. This trend is reinforced by content formats migrating from mobile-specific into mainstream Internet formats as handsets get more advanced. Service delivery platforms function as an indicator of the uptake of data services and is the glue between end-users and the originating content. Service delivery platforms also drive a convergence between IT and telecoms companies. This means lower transaction costs for major brands to expand into mobile content distribution.

In this paper we compare business strategies and technology choices from Japan and the EU in the period 2000 to 2005 among the following actors: carriers, mobile content providers, service delivery platform providers, and retail brands. Although different business strategies have been pursued in Japan and the EU we show that underlying key delivery technology is similar, and the patterns of IT and telecoms convergence are clear. This analysis also demystifies the content delivery process in Japan.

We use both concepts of network effects and systems evolution to explore how content provision has changed in the market to accommodate evolving service delivery platforms, containing disruptive technologies, and the associated business models, that are affected by coordination costs. This research is built on extensive industry contacts in Japan during two periods, 1999-2001 and 2002-2005.

Key Words:
IT, Telecom, convergence, mobile services, The EU, Japan

1. **Introduction**

To explain the success and hurdles of mobile Internet services in Japan and the West, Funk (2001, 2004) uses the concepts of network effects (Shapiro & Varian, 1999) and disruptive technologies (Christensen, 1997) that we will adopt in this paper. Patterns of industry convergence are generally thought to occur at a number of different levels: the product-market level, the technology level and the firm level (von Tunzelmann, 1988). Mobile phone products are increasingly compatible with standard Internet file formats (MP3, MPEG, Real, and windows formats) and the technology richness of high-end phone contents are getting close to that of the fixed-line Internet, while keeping the mobile-phone's near-ubiquitous geographical reach. On the product and technology level most handsets in 2005 combined camera and media player functionalities. We claim that industry convergence between IT and telecoms, at the firm level is increasingly being achieved through standardisation and the dissemination among actors possessing competences in mobile service delivery technologies. This paper utilises "coordination costs" (Clemons et al, 1993) to provide a study lens to view the content value chain in Japan and the EU. This study lens enables us to identify actors and their business strategies enacted between 2000 and 2005 in both markets. The business strategy includes the positioning in the value chain and technology choices in content delivery activities among actors. Hughes' (1983) technology system approach, and the view of innovation as overcoming reverse salients, is used to describe the current status of mobile service delivery platforms within the mobile Internet technology system.

Disruptive technologies improve certain product features while sacrificing others, and are typically more appropriate for new customers than existing ones. Christensen's (1997) study of the hard disk drive industry in the 1970s and 1980s, 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 the new customers. This trend was repeated for minicomputers, PCs and laptops. However, Funk (2004) notes that some technologies are disruptive for some incumbents and not for others, depending on previous technology base and choices: Sharp and Seiko commercialized LCDs faster than RCA (who was the first firm to develop LCDs) 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 (insufficient speed), which was the main market for semiconductors in the US. Another aspect of disruptive technologies is their starting point from a lower performance level, and what Christensen et al (2002) calls "overshoot" the demands and expectations of customers when entering the mass market. Disruptive technologies often offer a higher performance increase than the industry average. This would ensure a certain performance "margin" in new innovation from disruptive technology and partly explain why an industry does not take on a homogenous technology form.

Network externalities, increasing returns and path dependencies can be summarized as network effects. In short, interconnected actors are affected by each other (positively or negatively), even if they are only indirectly connected (Shapiro & Varian, 1999). The value of a network increases with the number of actors connected, in our case the number of handsets that can easily be reached by one service delivery platform. Innovation is often described as path dependent where innovators and users accumulate sunk costs and become locked-in. If a user base is tied to a technological standard, increasing returns therefore 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 install base before competitors create path dependency among customers (Grindley, 1995)

"Coordination costs" is the cost incurred by the firm in coordinating with other organisations or potentially pricing the product (Clemons et al, 1993). The term coordination cost is interpreted in a broader sense to include the cost of exchanging information and incorporating that information into decision processes, as well as the cost incurred by the firm due to delays in the communication channel. Typically a good IT infrastructure, such as email, Internet, and common databases decreases the coordination costs.

"Reverse salients" are used by Hughes (1983) to explain how technical innovation focus around the elimination of obstacles to growth, called reverse salients. Technical artifacts are typically part of a technological system (the mobile Internet in our case), where growth patterns are driven by a need to maximise the load factor (the ratio of average usage, which determines revenue) until a peak is reached, which determines the necessary capital investment. Hence innovation can be seen as a system of interdependent technology components gradually moving forward as pockets of resistance (reverse salients) to system innovation are overcome.

Following a description of key characteristics of service delivery platforms we give a brief history to how the mobile Internet developed in Japan and the EU, showing the importance of content delivery, and identify key players. Then we describe their business strategies. Thirdly we identify the key technologies of mobile service delivery, and show that components are increasingly becoming standardized in this previously fragmented part of the mobile industry.

2. Key Characteristics of Mobile Service Delivery

The major technologies enabling the mobile Internet can be thought to be, and include the interfaces between: Infrastructure networks, handsets, and service (or content) delivery systems. Both infrastructure networks and handsets have entered a high level of standardisation across markets, and mass production for the global market. But service delivery platforms are only partly standardised, and only recently started to develop from proprietary and local systems, towards generic modules and the mass market. In Hughes' (1983) terms, content delivery systems are technology components currently defined as a "reverse salient" to the further take off and dissemination of the mobile Internet. Massive resources are currently being invested by all four key actors to achieve new service delivery innovations that would enable a higher output of the whole mobile Internet system. Strategy Analytics (2005) estimate that US$175m is being invested worldwide in SDPs in 2005 and US$325m in 2007, then rising to US$375m in 2008. Much technical progress have been done since 1999 but the service delivery platforms could still be seen as a reverse salient on its way to be corrected.

When the mobile Internet became available around 1999 in both the EU and Japan, delivering content was a disruptive set of technologies 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. For users the content was expensive, difficult to use, and of poor quality. We argue that continuing standardisation and convergence of content formats and delivery

technologies have been instrumental in providing the basis for new business models. This makes the mobile Internet decreasingly disruptive for several actors in the mobile delivery value chain, and will spur new entrants. Funk claims (2004) the mobile Internet can still be disruptive for PC Internet content providers, as they must 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 PC Internet like Tsutaya Online (records, books) and Index (perfume) in Japan. In this way technologies can be disruptive for some firms and not others.

As new content delivery technologies enable PC (and other) actors to deliver content to already existing phones on the market, network effects support an increasing value for mobile service delivery technologies, providing a positive feed-back process between users and providers. 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). Partly for the same reasons, (Japanese companies rarely provide employees with business phones) Japanese carriers had an early success among entertainment contents, with service providers early setting their targets 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. Overall, Japanese carriers were quicker in interpreting signals of network effects and positive feed-back from consumers than its European counterparts. As a contrast, the low replacement rate of handsets and lacking customer relationship management from carriers towards service providers in Scandinavia (the leading GSM market at the time) exemplify how network effects were kept back from work in 1999 to 2002 in the EU (Kärrberg & Sigurdson, 2002).

In our analysis we have chosen the following six activities as markers of the content delivery value chain:

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.

The activity flow above is modelled in figure 1 and is valid for both WAP/i-mode and SMS:

[Fig 1]

This division serves our purpose of describing how actors have changed their value chain focus (business strategy) between year 2000 and 2005 in Japan and the EU.

In the selection process of actors to study, one comes up with the key industry actors: 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 either 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 brand makers. Handsets and infrastructure features are 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. Especially, we look at technology choice as part of the business strategy, and map the activities in figure 1 against underlying technologies in figure 2:

[Fig 2]

The independent technologies used within each activity are explained below:

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.
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.

Limitations to realigning activities and acquire technologies in the value chain are represented in this paper by coordination costs for vertical integration and horizontal cooperation.

3. Technology Standards & Initial Business Strategies, 1999-2002

When comparing the EU and Japan the first major difference is in the usage of GSM versus PDC as the network standard. At a first look, it would seem as the EU had a head-start as GSM is a global standard and PDC is not. The first mobile Internet services in 1999 focused on information services both in Japan and the EU, as carriers believed business users would drive revenues. But 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. High coordination costs in Europe kept content providers from expanding cross-boarder sales, as incumbents all had different billing systems, portal policies and regulations. So it turns out the larger size of the EU market didn't have any positive effects for the mobile Internet compared to Japan in the starting phase. There are many similarities when looking back in time: Both markets were pioneering the mobile Internet, and WAP even had a head start over i-mode (and WAP was adopted by KDDI, the second carrier) as a mark-up language. Handsets had black and white screens and no ring tones or java games were available in Japan or the EU during launch in 1999. Messaging, the "killer application", took off already back in the mid-90s as the first data application in both markets, and still in 2005 provide most of the non-voice revenues.

There are also clear structural differences: The market fragmentation and power struggle that took place in Europe between handset makers and carriers didn't take place in Japan. From the beginning PDC ensured that no roaming to other countries was possible, so the Japanese handset makers became suppliers to the carrier handset wholesale departments, especially to the giant Nippon Telecom and Telegraph (NTT) and its daughter company DoCoMo. The "always-on" packet networks (GPRS) in Japan were not available until 2002 in most EU markets. Another major difference was the clear value proposition that Japanese carriers offered compared to EU carriers.

Network effects explain how these important differences became magnified into success in Japan and a conceived failure in the EU. Feed-back processes (Grindley, 1995) in Japan early produced a few profitable content providers, that inspired other content providers, more users signed up, and carriers (NTT DoCoMo mainly) expanded its content departments. An existing world-class cluster of entertainment service companies in Tokyo (gaming, animations, karaoke) also contributed to a rapid mobilisation of production resources into the new mobile Internet distribution channel (Kärrberg & Marnung, 2001).

4. The Value Chain Evolves: Service Delivery Platforms 2002-2005

The internationalization of content sales in the EU (and bureaucratic carrier organisations) gave birth to the SMS and WAP brokers, an industry actor still unknown in Japan (in 2005) as off-portal billing is not possible. Content aggregators specializing in carrier relations developed both in Japan and the EU, but didn't take off in the EU until 2001 with premium SMS. Specialized content providers emerged both in Japan and the EU before 2000, when Japanese content providers brought established brands to the mobile business (Bandai/Disney, Cybird/Popeye, SEGA), whereas many EU content providers (CPs) tried to create their own contents. The service delivery platform market emerged in Japan as a clear industry segment in 2002-2005, whereas the EU roaming challenge early on called for these systems to efficiently connect

service providers to multiple carriers in different markets. A strong trend is for retail brands to build their own portals in the EU and charge for content via premium SMS, without dealing directly with carriers. The carrier portals are gradually decreasing as entry point and customer education arena in the EU.

Advertising and retail brand makers are increasingly using both mobile marketing and Internet web pages for an optimal media mix of geographical "reach" and content "richness" (Funk, 2004). Firms are compensating for the low richness of the mobile Internet by integrating it with other media. As the mobile Internet has been a disruptive technology and not easy to integrate with other media until recently, mobile advertising has been done separately. The only area at the moment seemingly far away from PC and mobile phone convergence is gaming, due to user interface restrictions and the usage of handset-specific java files.

In both the EU and Japan, service delivery platforms have not yet overshot the functional needs (Christensen et al, 2002), as most customers ask for customized solutions. This is partly due to the fact that no dominant design has yet emerged for coordinating underlying technologies in service delivery platforms. SDP providers have worked hard to offer the underlying technologies in fig. 2 as independent modules with connecting APIs. But the typical sales options still consist of either new customers (typically media retail brands, such as TV, radio, entertainment) willing to accept the disruptive technology, or established customers who either demand very high services levels (typically carriers) and/or extensive integration with existing systems (typically content aggregators). As the underlying technologies increasingly deal with standard Internet content formats, we argue that the boundaries between underlying delivery technologies blur, which would inspire vertical integration (Christensen et al, 2002). But the SDP product boundaries (the perception among customer what functionality they want from the "black box") could increasingly become modularised as dominant product designs will emerge, which would imply room for horizontal disintegration. Nevertheless, a tendency in the market during 2005 was to address the reverse salient of service delivery systems by vertical integration. Mostly between mobile SDP companies and other IT companies who see synergy effects between mobile and standard Internet delivery systems and to deliver full solutions to carriers and retails brands. But also telecom infrastructure providers (both Nokia and Ericsson to name two), have deployed service delivery offerings as they move aggressively into maintenance of carrier networks. This vertical integration makes it increasingly difficult for smaller SDP vendors to survive due to increased cost pressure and service demands.

Hughes' concept of "reverse salient" (1983) can be used to see how in both the EU and Japan acquisitions of competitors and partners in the service delivery space sped up the integration of the content delivery process from 1999 and onwards: In the EU disproportionate resources from venture capitalists poured into marketing towards carriers to break their "not invented here" attitude towards outsourcing of key components in the delivery architecture. In Japan NTT DoCoMo broke new ground already in 1999 by overcoming the coordination challenge in the value chain: 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.

Some key driving forces for integration and convergence between the mobile and fixed Internet in 2005 can be summarised in:

- Technology components of the service delivery platform are becoming standardised and smaller players are merging into larger ones as margins decrease.

- Carriers want to buy standard and exchangeable components after many experiments with small and proprietary systems the last 5 years.

- Established media companies want to deliver their content by themselves, not only directly to carriers. They desire to plug into the carrier's billing systems (through billing mediators), but deliver contents to end customers by themselves.

5. Business Strategy & Technology Choices 2000-2005

The mobile service value chain and related business strategies can be seen through our lens of coordination costs. All four actors have overlapping and unique core competences: carriers run their networks and bill customers for accessing them, 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 brand makers look to expand with already successful products into the mobile distribution channel.

In the value chain typically two large actors have much resources to spend: the carriers and the retails brands. But neither of them have originated in the mobile telecom industry, and in many cases lack a differentiated view of mobile consumer behaviour (mainly carriers) and underlying technologies (foremost retails brands). The typically smaller companies in content aggregation and service delivery often come from the same background: Set up just before or after 2000 by big telecom company drop-outs in order to exploit new business opportunities. Most content aggregators before 2003 used their own, or the carrier content delivery mechanisms. Many aggregators or SDP vendors still engage in both contents and service delivery solutions. Financial strains have been a close companion to most aggregators and SDP providers, with a few striking exceptions in primarily Japan (Bandai, Cybird, Index e.g.) but also the EU. Coordination costs for accessing the right branded content, often outside the national market, has been typical problems for aggregators. SDP providers, due to IT and telecoms convergence, have had the advantage of increasingly working with standard internet technologies, and thereby become partners with or subsidiaries to other IT companies. As technology providers, some SDP providers suffer from lacking information on consumer behaviour, or coordination costs in explaining and market their solutions to their customers. There are no clear activity boundaries between SDP vendors and the other actors, as service enabling technology is utilised throughout the value chain by several actors and no dominant designs can function as bench marks. The activity boundaries (Figure 1) could in many cases be argued to not contain necessary information required for an efficiently functioning seller-buyer market to exist. Management and integration, rather than markets, constitute the most efficient coordinating mechanism across such interfaces, called "interdependent interfaces" by Christensen et al (2002). This could be one of many explanations to ongoing mergers and acquisitions involving SDP suppliers in recent years.

Since the beginning of i-mode in Japan in 1999, WAP/i-mode billing and not SMS billing on the carrier portal is the only way of charging for contents. Successful entrants have emphasized the carrier portal. Human relations and trust with the carrier is sometimes more important than technology choice. In the EU the emergence of SMS billing as the dominant transaction form has enabled the off-portal business (and billing aggregators) to grow substantially, where direct contact with the carrier is not necessary for the service provider. 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 carriers coordinated portal management, handset releases, and got their revenues mainly from traffic/packet fees and a much smaller share from the content fees (the carriers kept 9% of content fees). The content provider could keep 91% of content revenues, but packet fees constituted the bulk of revenues from the mobile Internet system at the time (which NTT DoCoMo didn't share). Only monthly subscription was available as the charging method. It was a clear business case for all parties and coordination costs were directed towards publishing content on the official portal.

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 for third parties.

In 2005 the successful model in Japan hasn't changed substantially. The same players occupy the same space with the exception of large retail brands managing their relation with carriers directly, and off-portal sites for advertising and other consumer interaction (non-charged) has been booming. Interaction between web pages and the mobile Internet has also increased.

In 2005 the EU looks very different from the awkward situation in 2000. The carrier portals have been marginalized for SMS services (that have gone off-portal) and service delivery platforms have become a key element for cost effective mobile Internet sites in the growing competition among carriers, retail brands and content providers. Several carriers have even outsourced portal management and focus 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 their own proprietary service delivery mechanisms. But 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 (most) and WAP (fewer) billing systems to trusted partners between 2003 and 2005. Most retail brands (including game makers) by 2003 hadn't ventured into mobile service delivery, so SDPs were not a disruptive technology to them. Carriers and brands launching mobile services are increasingly concerned with commercial aspects of content editing and retailing rather than the basic functionality of handset rendering and content management. Customer business benefits

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

[Figure 3]

Notes to figure 3:

- Arrows denote main areas of activity and dotted arrows activities that were undertaken often enough to affect the competitive landscape.
- Mobile CP (mobile content provider) is defined as a company started up for the sole purpose of creating, aggregating and/or distributing content via the mobile Internet or SMS.
- SDP providers enable the other actors to publish raw content files for all handsets.
- The clear activity zone of Japanese carriers can be compared to the wide scope of EU carriers in year 2000.

[Figure 4]

Notes to figure 4:

- The reasons for increasing market demand for SDPs are different in Japan and the EU. Japan: network effects and success of the mobile Internet means that sites are launched rapidly, but only about 10% are profitable. To cut costs on manual updates is crucial. The EU: The technical complexity of delivering contents on multiple networks makes it necessary to focus on core skills and partner with other value chain players.
- The boarder between the 4 actors is blurring in the EU, as technology focus and profit zones are changing. Some technologies become commoditized (content management systems, compression) while others evolve as increasingly important with special suppliers (site builders, DRM). But the over-all trend is that technology matters less and fully serviced storefront offerings attract the cash rich players: retail brands and carriers.

Figure 5 shows that although the same technology interaction is used in Japan and the EU for content delivery, what differs between the Japanese and EU market 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 will most probably create a traditional two-fold segmentation in a maturing market: specialized component makers, and large system retailers who market off-the-shelf solutions. It can be argued that similar patterns of technology convergence in the SDP markets of Japan and the EU is a strong indicator of a global IT and telecom convergence in general, as the mobile Internet and the PC Internet systems are converging.

[Figure 5]

The creative process of producing “mobile” (audio, video, games, images) contents is decreasingly held back by limitations of the handsets. This supports two parallel developments: integration of the steps in the delivery mechanism, and decreasing need of reformatting the content. Nevertheless there are several steps before even a standard MP3 file can be delivered

from a content provider to the handset in a correct way. Not to mention an analogue image that needs even more formatting before being downloaded to the user handset. From an initial WAP focus in the EU, SMS came to take over as delivery format during 2002-2005 in the EU. In 2005 the mobile Internet (WAP/i-mode) has experienced a revival due to better technology and interest from media companies to offer users a richer experience.

Software convergence in the delivery mechanism means that encoding and decoding increasingly involve standard file formats, so that off-the shelf tools can be modified to work with mobile content, instead of a need for custom made and expensive new tools. Similarly, handset recognition, content management (including database tools) and delivery mechanisms were being offered in 2005 as modules, that can be integrated through APIs (application programming interfaces) by non-mobile players who want to offer their contents. Hosted services make the technology components in an SDP even more flexible to deploy into customer solutions. Services are simply offered on-line (DRM encapsulation, video trans-coding, third party management) or as a fully hosted service with web interface access. Many early systems demanded on-site deployment of servers, but the flexibility and low upfront capital expenditure for hosted services, have increased the attractiveness of SDPs. Financial strength is also becoming a prerequisite for bidding on projects for two reasons: Carrier and retail brands want long-term suppliers, all partners bidding in the same project are only as strong as the weakest link.

In figure 5 an overview is given of how the different parts of the service delivery platform architecture have been used in the Japanese and EU markets during 2005. Carriers in Japan early on demanded advanced device discovery and on-the-fly trans-coding for fitting images to the screen. In the EU there has been an early interest in streaming (media player) and DRM, both driven by the media industry. Apart from these differences, the technology focus is similar, continuing to converge and service delivery system innovation has become a global rather than local phenomena. A time-lag can be seen between Japan and The EU: large CPs in Japan just started to outsource content management/adaptation, since mobile sites are larger but fewer in Japan than in the EU, and there are only three operating carriers. SDPs are becoming a part of the corporate IT systems with new demands: 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 become dominant, the weight of innovation will change from specialized telecoms solutions into adapted IT solutions for the mobile space. The business strategy chart (Fig 4) and the technology choice diagram below (Fig 5) are interdependent of each other, as technology choice is part of managing a certain activity.

Below the increasing complexity of SDPs is visualized (Informa, 2005):

[Figure 6]

Finally we present a summary of business strategies in Japan and the EU area between 2000 and 2005:

[Table 1]

6. **Conclusions:**

Before the launch of the mobile Internet in 1999 (and earlier) there was a view among observers that technology architecture and standards would shape the necessary business strategies. But a plethora of actors and events interplayed and business strategies rather evolved as a response to network effects in an emerging business-technology system. We have studied the main reverse salient in this mobile Internet technology system, mobile service delivery platforms (SDP), and its role as indicator of these system changes. Comparing the EU with Japan we see an exploration phase with different approaches involving disruptive technologies beginning 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. Other conclusions are summarised below:

Mobile content delivery – visualized in this paper by service delivery platforms - is becoming commoditized and technical differentiation becomes less important:
Carriers and brands launching services are more concerned with commercial aspects of content editing and retailing than basic functionality of handset rendering and content management.

Building partnerships to become future-proof in the eyes of customers critical:
To be seen as a viable partner for multiple business scenarios, the SDP providers must leap into building commercial networks as they become part of corporate IT systems. Financial strength is also becoming a prerequisite for bidding on projects.

In the light of Telecoms and IT convergence, service delivery innovation will increasingly take place in collaboration between the telecoms and IT industry:
As standard Internet formats become dominant, the weight of innovation will change from specialized telecoms solutions into adapted IT solutions for the mobile space. SDPs evolve into integrated components where standard Internet technology increases in importance as handsets continue to get more advanced.

Service delivery technology choices in Japan and the EU are similar and converging:
The market is getting crowded so expertise in certain areas and open APIs being populated by third parties are the only ways to keep up with new process innovations. Two players will remain in the SDP segment: specialized component makers, and large system retailers who market off-the-shelf solutions. It can be argued that the similar patterns of convergence in the SDP markets of Japan and the EU is a strong indicator of a global IT and telecom convergence in general. This is due to the central role of SDPs as glue between end-users and the media industry.

Mobile service delivery is the last reverse salient to be solved in the mobile Internet system:
Mobile infrastructure and handset products have both entered mass production, dominant designs prevail, and open APIs for third parties are provided. For mobile service delivery platforms, the third main component of the mobile Internet technology system, underlying technologies have been identified by actors in the value chain. Massive resources are currently being invested by actors in both the mobile and PC industry to achieve new mobile service delivery innovations. This will eventually enable a fix to the mobile service delivery as a reverse salient (Hughes, 1983) and result in a higher net output and load factor of the mobile Internet system as a whole.

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Appendix: Figures and Tables

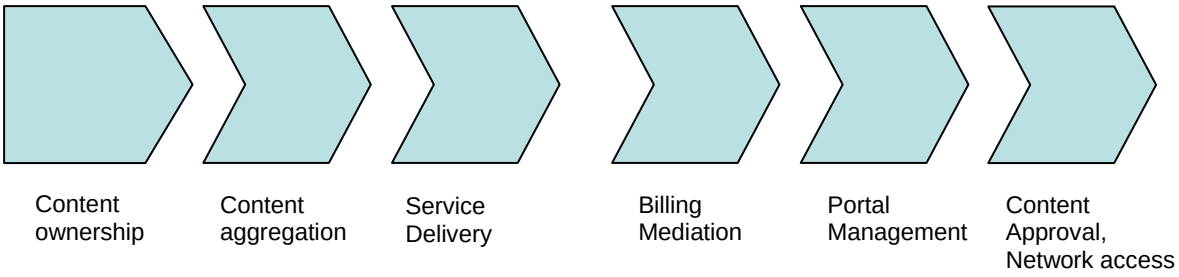

Figure 1. The activities involved in mobile service delivery

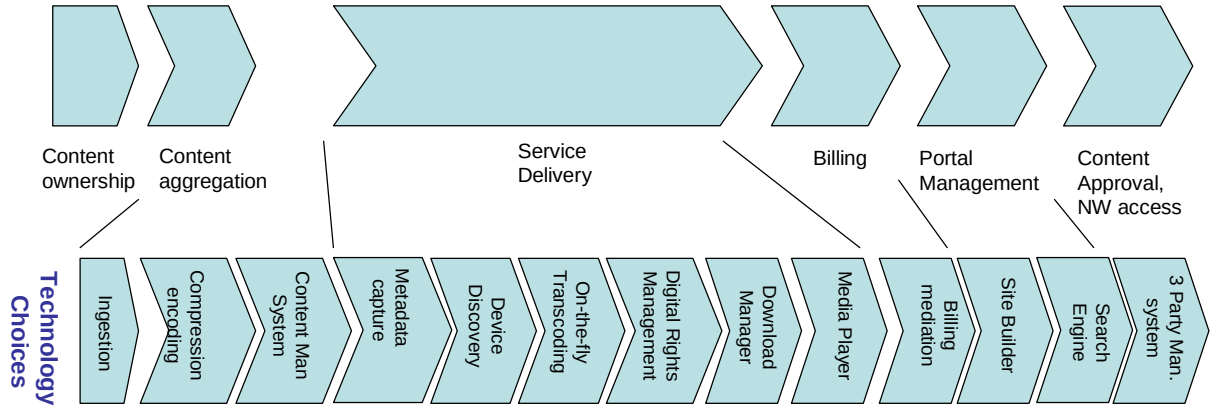

Figure 2. The underlying technologies for mobile service delivery

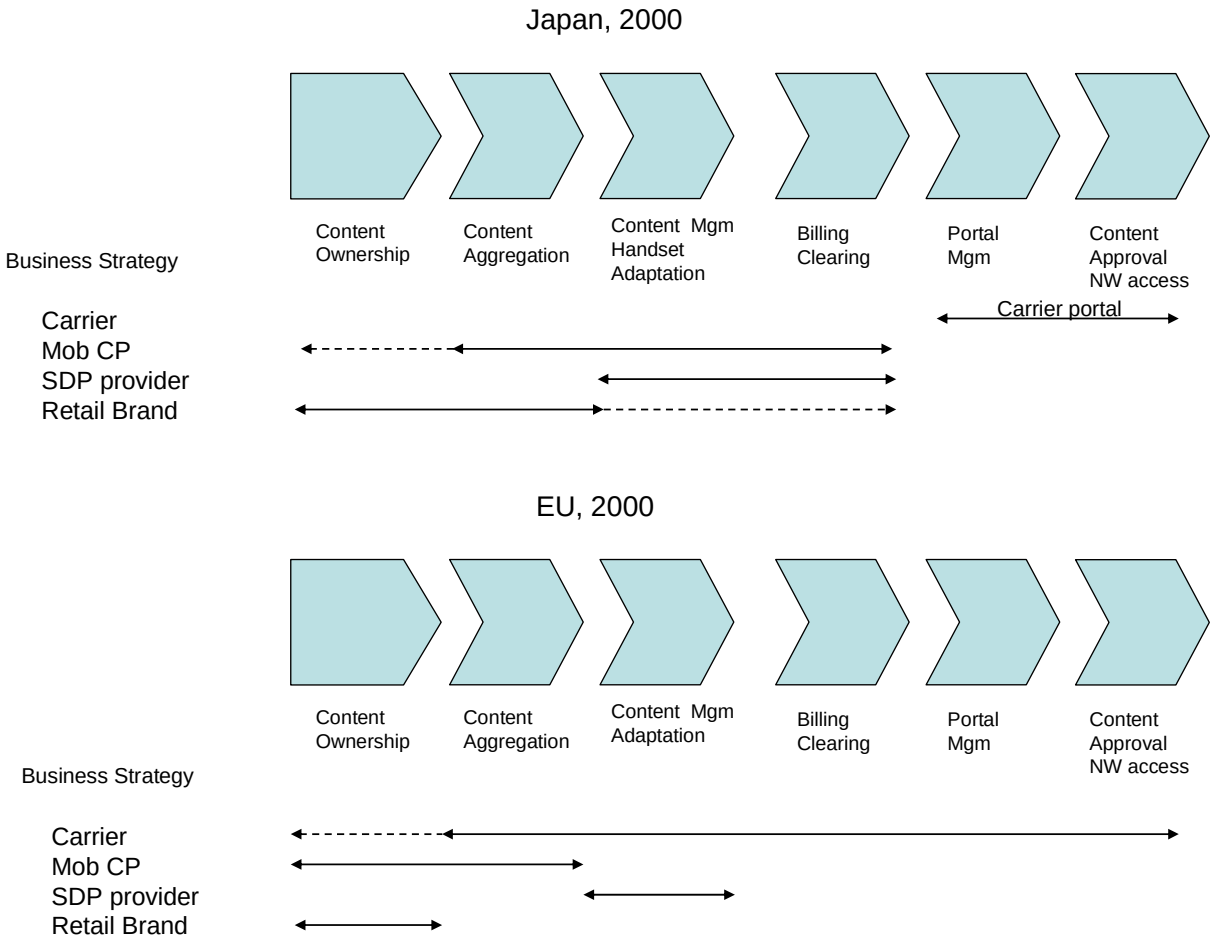

Figure 3. Activities as business strategy among actors in mobile service delivery, 2000

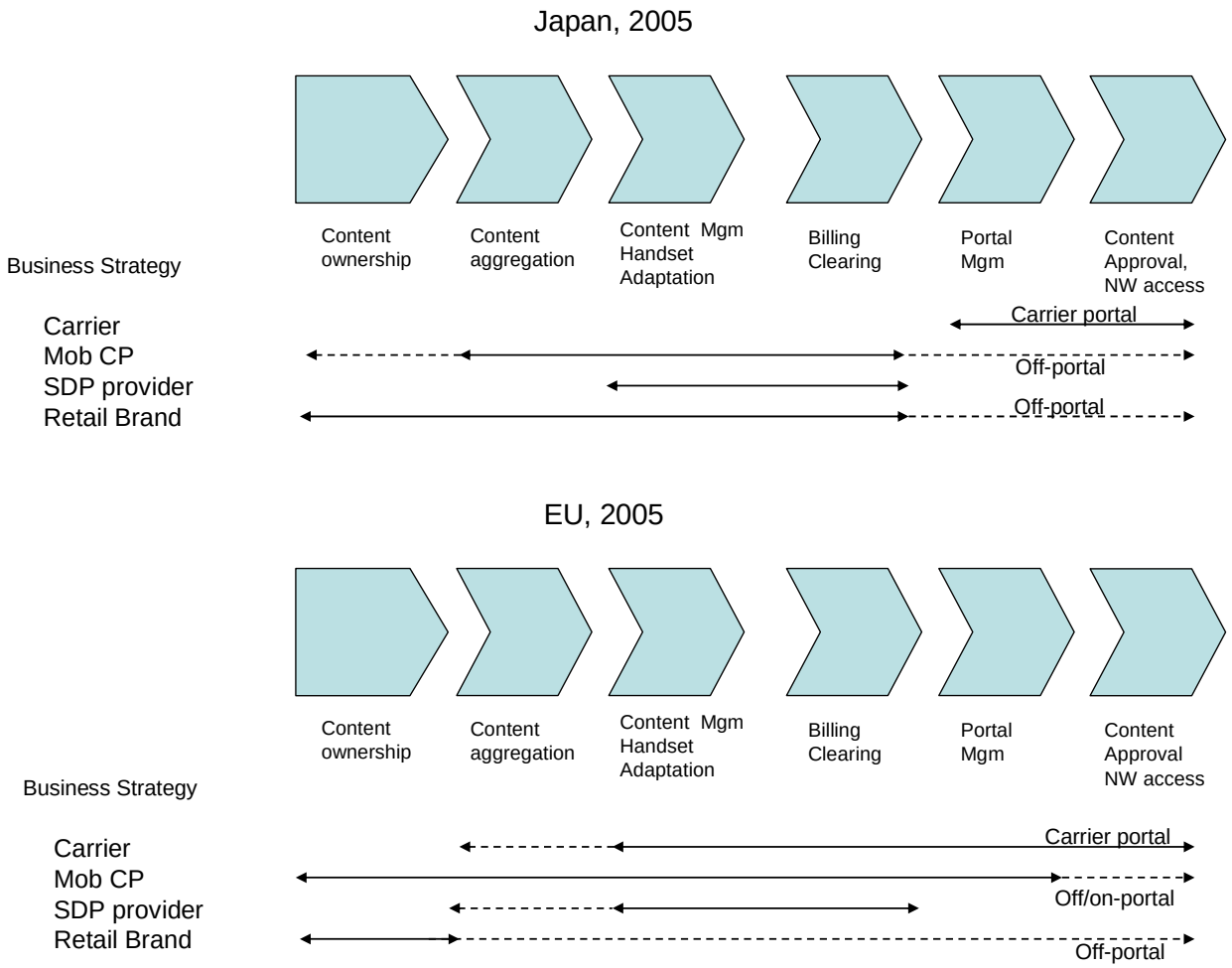

Figure 4. Activities as business strategy among actors in mobile service delivery, 2005

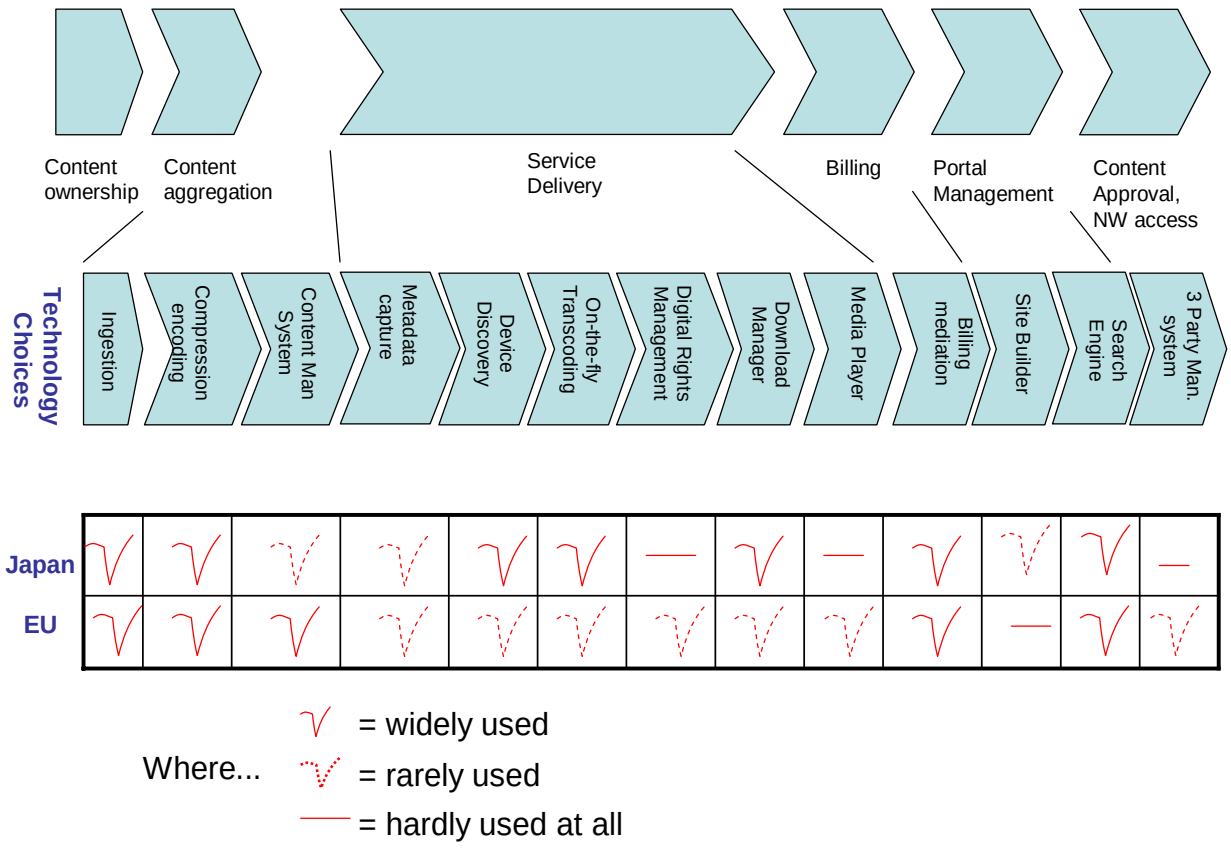

Figure 5. Technology Choices in Japan and the EU for service delivery platforms, 2005

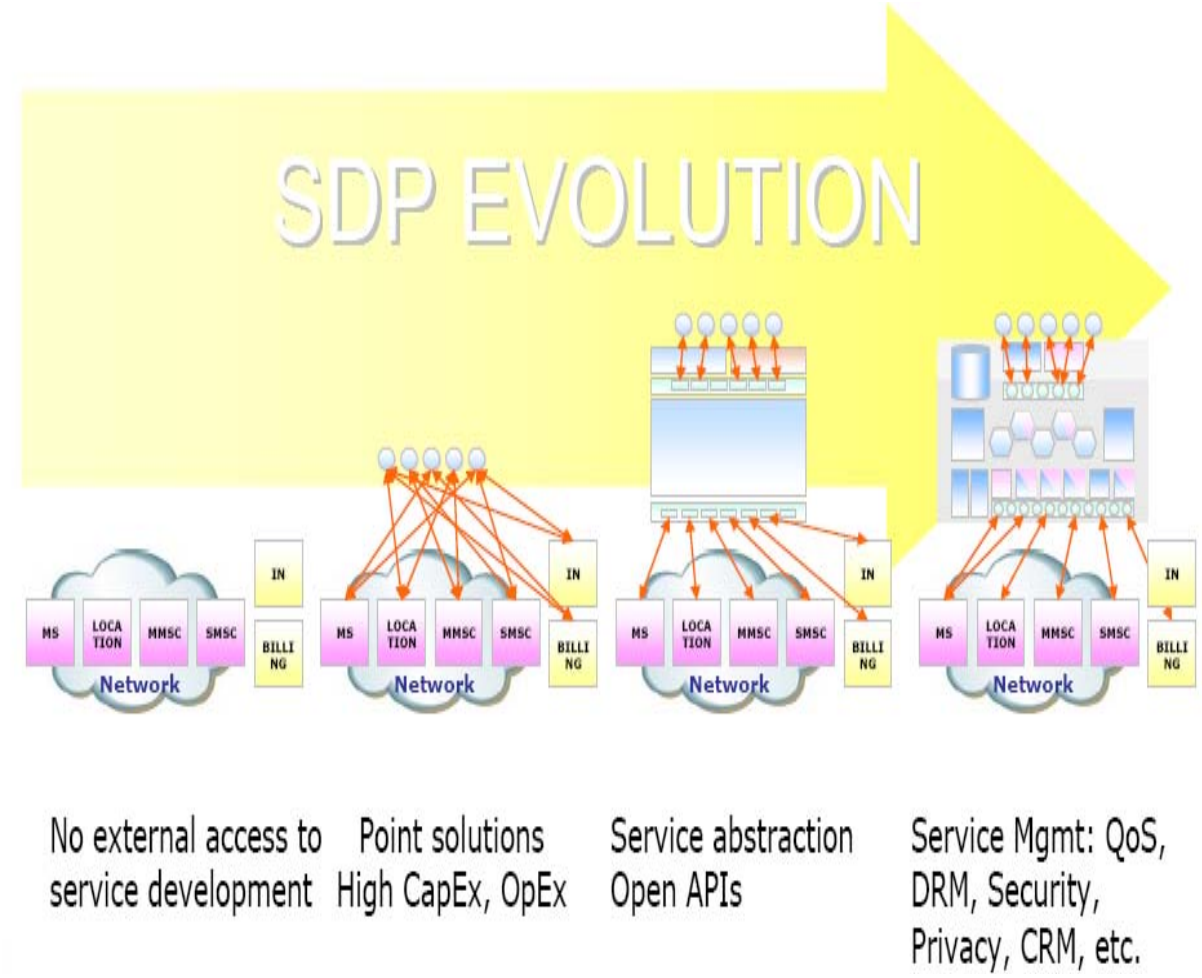

Figure 6. The service delivery platform evolution, the trend towards more complex systems (Source: Informa, Informa SDP conference in Brussels, July 2005)

Table 1
Japan/EU, comparison of business strategy, year 2000/2005

	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