Mobile Television: Challenges of Advanced Service Design

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Abstract

In this paper we propose an integrative framework, based on dynamic, evolutionary models of the evolution of industries. The main arguments are illustrated using the case of mobile TV. One main assertion is that the value network of mobile data services is much more complex than that of previous "generations" of mobile services, in particular voice and messaging. The new environment requires a significantly higher degree of coordination and integration between more participants in the value net and a consistent constellation of technology, policy and firm strategy. Unless such compatible arrangements are in place, mobile TV will not take off.

The paper develops these themes theoretically and illustrates them with a detailed case study of mobile TV in South Korea as well as comments on the situation in Europe and the U.S. The private and public sectors in South Korea were capable of producing conditions in which mobile TV could flourish. Even so, significant challenges remain to create a financially sustainable mobile TV industry. In contrast, in Europe and the U.S. major obstacles to the development of mobile TV continue to exist. Unless these obstacles, including problems with spectrum policy, are addressed, mobile TV may not be able to develop its full market potential.

1. Introduction

Reporting from the Consumer Electronic Show in Las Vegas in January 2007, Business 2.0 Magazine declared 2007 as "The year of mobile TV".[1] The year before, in 2006, consulting firm Strategy Analytics predicted that the global market for mobile TV subscribers would reach 120 million and generate annual revenues of $5 billion. Many operators and industry experts look at mobile TV as one component in the service mix that will eventually help revitalize the stagnant or declining average revenues per user (ARPU) in mobile voice and messaging markets, which are still the dominant mobile market segments.

During the 1990s, many mobile operators were looking for the next killer application that would drive revenues. However, this vision soon was replaced by the consensus that a mix (a "killer cocktail") of applications and services would be required to drive mobile data revenues. Despite high expectations since the late 1990s, mobile data services have been sluggish and not nearly grown at the anticipated rates. J.P. Morgan and Arthur Anderson, in an influential study released in 1999 predicted that mobile data services, including multimedia, would make up nearly 50% of the revenues of European mobile operators by 2006. The actual share of mobile data services in ARPU ranged from 7% in Sweden to 26% in Japan, but fell in any case far short of the expected contribution (FCC 2006, p. 107). Why revenue growth was so much slower than anticipated has not been answered satisfactorily.

As carriers continue to pursue service innovation, lessons may be learned from the fact that some mobile operators have had more success than others in designing and launching mobile data services. In this context, it is interesting to note that the momentum in the mobile industry has shifted during the past two decades. During the first generation of mobile services, the U.S. was the pioneering market. Leadership migrated to Europe when the second generation mobile service was introduced. But Europe could not prolong its leadership to subsequent mobile platforms and fell behind several Asian nations, most notably Japan and South Korea. At this point, there is no obvious leader-region as the industry moves on to high-bandwidth mobile

[1] M. Lev-Ram, "2007: The year of mobile TV," *Business 2.0 Magazine*, January 11, 2007.

services. Only partial models and explanations of the conditions of successful service design and of these shifts in fortune and deployment for advanced mobile services are currently available.

In this paper we provide a new framework, based on dynamic, evolutionary models of business, to better understand the factors upon which success and failure depend. The main arguments are illustrated using the case of mobile TV. One assertion is that the value network of mobile data services is much more complex than that of previous "generations" of mobile services, in particular that of voice and messaging. Successful configuration of many new services requires a significantly higher degree of coordination and integration between more participants in the value chain. Moreover, it calls for a consistent constellation of technology choices, policy measures and firm strategy. Deviation from these conditions of success does not necessarily obliterate a new service but it may significantly slow its acceptance in the market place.

The paper is organized as follows. Mobile television platforms and their economic characteristics are discussed in the next section. The third section briefly reviews the conditions for the design and implementation of sustainable advanced mobile services. Section four presents a detailed case study of mobile TV in South Korea and section five draws key lessons for business strategy and public policy in Europe and the U.S. Conclusion and questions for further research are presented in the final section six.

2. Mobile TV platforms

Several technical solutions are available to deliver video content to mobile terminals. Live broadcasting can be delivered in-band via mobile network platforms and via terrestrial or satellite-based broadcasting networks. Semi-live delivery via vodcasting may compete with live mobile TV, at least for certain types of content (but will not be further explored in this paper). Mobile TV has been a possibility in several countries based on streaming solutions via 2.5 or 3G mobile networks. However many mobile operators are currently facing a decision of whether to continue offering mobile TV services over their mobile networks or whether to migrate them to broadcast technologies like DMB, DVB-H or MediaFLO. The most appropriate business approach depends on the characteristics of these options and the policy and market environment in which they are deployed.

2.1 In-band mobile TV

With in-band transmission mobile content is delivered to terminals via existing cellular networks. The broadcast signal is transmitted within the same channels as traditional voice and data traffic. Several technological solutions are available, including point-to-point (unicast) transmission and multicasting. Industry data indicate that 90% of mobile TV trials use unicast solutions. Multicast technology ─ most importantly Multimedia Broadcast Multicast Service (MBMS) ─ is not yet commercially deployed, although it offers significant advantages over unicast with regard to network utilization and hence investment costs. With in-band transmission, services may be configured by the mobile service provider or a third party, such as MobiTV typically in collaboration with the network operator. Moreover, emerging solutions such as Sling Media allow user-configured mobile TV.

In the first case the network operator is fully in charge of the transmission platform and content. An example in the U.S. is V CAST Mobile TV by Verizon Wireless, offered in collaboration with MediaFLO, a subsidiary of Qualcomm, which also operates a dedicated multicast network. In this approach, the mobile network operator has broad control over business arrangements and revenue streams. It can package different mobile TV solutions based on agreements with different content providers (Tadayoni & Henten, 2006). However, as the aborted trial by ESPN Mobile in collaboration with SprintNextel illustrates, reaching a break even number of subscribers may be difficult.

Another solution is the collaboration between mobile TV service provider MobiTV and network operators, which have teamed up to offer service in several countries. MobiTV offers several dozen channels optimized for delivery over 2.5 and 3G networks. The network operator serves as the delivery pipe, generating revenues from the sale of mobile data service. For example, in the U.S. Cingular recommends that customers using MobiTV purchase the MEdia Max

Unlimited Bundle for $39.99 per month to avoid overage charges. Likewise, Sprint/Nextel recommends subscribing to the Power Vision® service plan.

A third solution is provided by Sling Media, which allows streaming cable TV or satellite TV from home via the Internet to stationary or mobile device. Sling Player Mobile allows watching TV on Windows Mobile and Palm OS devices. It supports any type of Internet connection, including EV-DO, UMTS, WiFi, and Bluetooth. In as far as a 3G connection is used, the model is similar to the two previous approaches (except that the channel lineup is as configured by the user at home). However, Sling Media also supports streaming via WiFi and Bluetooth, which might undermine the ability of mobile network operators to derive revenue from mobile TV, at least in areas where free WiFi access is available.

Table 1: Alternative mobile TV platforms

Platform		**Countries** (service provider, year)	**Features**
In-band	DVB-H	Italy (3 Italia, TIM, Mediaset, Vodafone, all 2006), Finland (Digita/Nokia, 2006), U.S. (Modeo, HiWire Mobile TV, planned for 2007), Germany (planned for 2008), Spain, France (planned)	Unicast, shares bandwidth with other mobile applications, existing handsets usable, potentially high opportunity costs of bandwidth
In-band	MBMS	Not yet commercially deployed	Multicast, otherwise like DVB-H
	Sling Media	10 countries, including U.S. and Canada (Sling Media, various)	User-driven and configured
Out-of-band	T-DMB	South Korea (six providers, 2005, limited coverage), Germany (Mobiles Fernsehen Deutschland, 2006)	Out-of-band, requires specific license, broadcast network investment, new handsets, additional coordination needs between players
Out-of-band	S-DMB	South Korea (TU Media, 2005)	Out-of-band, requires specific license, broadcast network investment, new handsets, additional coordination needs between players
Out-of-band	MediaFLO	U.S. (Verizon, 2007)	Out-of-band, requires specific license, broadcast network investment, new handsets, additional coordination needs between players

Source: own compilation.

An advantage of all forms of in-band transmission is that many (but no all) handheld devices on the market are compatible with mobile TV. Unlike mobile broadcasting, in-band transmission does not require the network operator to acquire new licenses for additional frequency bands. However, the available channel capacity will be shared with other data and voice services, which could place a high opportunity cost on bandwidth once present capacity limits are reached. In this case, adjustment of the existing network capacity or prioritization of uses may become necessary. In all cases, complex roaming questions may arise, in particular if international borders are crossed. Likewise, intellectual property right problems could be triggered if content is streamed to other nations. In the case of Sling Media the willingness of consumers is not well known to pay additional wireless data charges to access content on mobile devices for which they already paid for as cable or satellite customers. The most significant disadvantage of in-band mobile TV, however, is the potentially high opportunity cost of bandwidth, especially in unicast mode.

2.2 Mobile broadcasting

The second technology solution is based on a combination of mobile and broadcast technologies. Content is transmitted via a one-way broadcast signal to the mobile terminals whereas the feedback or interactivity channel is implemented using mobile networks. Mobile broadcasting may be terrestrial-based or satellite-based. The three most promoted solutions are Digital Video Broadcasting-Handheld (DVB-H), Digital Multimedia Broadcasting (DMB), and Media Forward Link Only (MediaFLO). DVB-H was formally adopted in 2004 by the European Telecommunications Standards Institute (ETSI) as a technical specification for bringing broadcast services to handheld receivers. It is an adaptation of the terrestrial digital video broadcasting standard (DVB-T) and can be configured in all or portions of the 170-230 MHz (VHF), 470-862 MHz (UHF), and the 1.452-1.492 GHz (L) bands.

DMB is an evolution of the Eureka 147 digital audio broadcasting (DAB) standard. It was developed in South Korea and, after earlier trials, service was launched in 2005. DMB is available in terrestrial (T-DMB) and satellite-based (S-DMB) versions. It is designed to operate in VHF band III or the L band. A serious constraint for the diffucion of DMB is the limited availability of these bands in some countries. For example, in the U.S. and Canada the former band is used for television broadcasting (channels 7-13) and the U.S. has designated the latter band for military purposes. Qualcomm's MediaFLO operates in the 700 MHz band (the former UHF channel 55) to provide a one-way multimedia signal (streamed audio and video, video clips, and data). Given the present U.S. and Canadian frequency allocation, it will most likely be the platform of choice for most of the North American market.

In contrast to the in-band solutions, mobile broadcasting requires new mobile terminals, capable of receiving broadcast signals. It also requires investment into a dedicated mobile broadcasting infrastructure. On the other hand, as frequency bands outside the cellular range are used, high capacity content will not congest the bandwidth of the mobile networks. Nevertheless, cellular networks also could be used to deliver personalized content at any time to the end-user. Mobile and broadcasting networks can be integrated to provide customized services via mobile broadcasting. In some countries, frequency allocation is a challenge for this solution. Not only are additional frequencies needed for the broadcast signals compared to the in-band solution, but their availability differs between regions of the world. Such differences could increase costs if economies of scale cannot be fully realized due to lower production runs. Lastly, mobile broadcasting requires finding sustainable agreements between mobile network operators and the providers of broadcasting content.

3. Conditions for designing sustainable advanced mobile services

Which solution offers the most promising business proposition depends on factors internal to the service providers but also on conditions that are to a large degree beyond their control or even influence. Among the internal factors are the resource base and core competencies of the service provider, the attitude toward risk, and the overall competitive strategy. External factors include the market environment, the available technology, and the public policy framework. After a brief look at the emerging mobile television value net, this section looks at these factors and how their co-evolution determines success or failure of specific solutions to mobile television.

3.1 The emerging mobile value net

In the mobile voice environment with its relatively simple technology, coordination along the value chain could be effectively achieved by standardization (Maitland, Bauer, and Westerveld, 2002). The new environment features a larger number of players, including handset manufacturers, network operators (cellular and broadcast), content providers (including specialized producers of mobile content, broadcasters and cable programming networks), mobile portals, application providers, and service providers. Coordination among these participants in the value net goes beyond technical issues and also requires agreement on mutually compatible business models (e.g., advertising, flat fees, service-specific direct payments, or hybrids).

Moreover, market uncertainty is generally higher, raising complicated issues with regard to synchronization of innovation and investment into risky activities. This may lead to dynamic inconsistency problems, for example, if network operators proclaim to wait for equipment manufacturers to bring handsets to the market before network specifications are finalized whereas handset manufacturers adopt the opposite stance. Standardization is important but not sufficient to synchronize and integrate these technology and business choices.

The specific coordination challenges vary with the mobile TV platform and the business model envisioned by the main players. For example, in-band solutions require that the mobile network operator arrange for the availability of terminals capable of receiving video; produce or acquire mobile content directly or in alliance with content providers; and package pricing and service plans that suit consumer needs. Mobile broadcasting requires, in addition, investment in a mobile broadcasting network. In this latter approach, it is not necessarily the cellular network operator who might be the organizer of the market. It could also be a content provider or a broadcaster — with the role of the cellular operator, in the extreme, relegated to providing upstream communication, possibly for a share in the overall revenues. The negotiating power of the mobile network operator in these various constellations depends on the public policy rules that govern terminal certification. In the U.S., certification is essentially done by the network operators, thus giving them a stronger say in the mobile broadcasting market compared to nations where one mobile standard prevails.

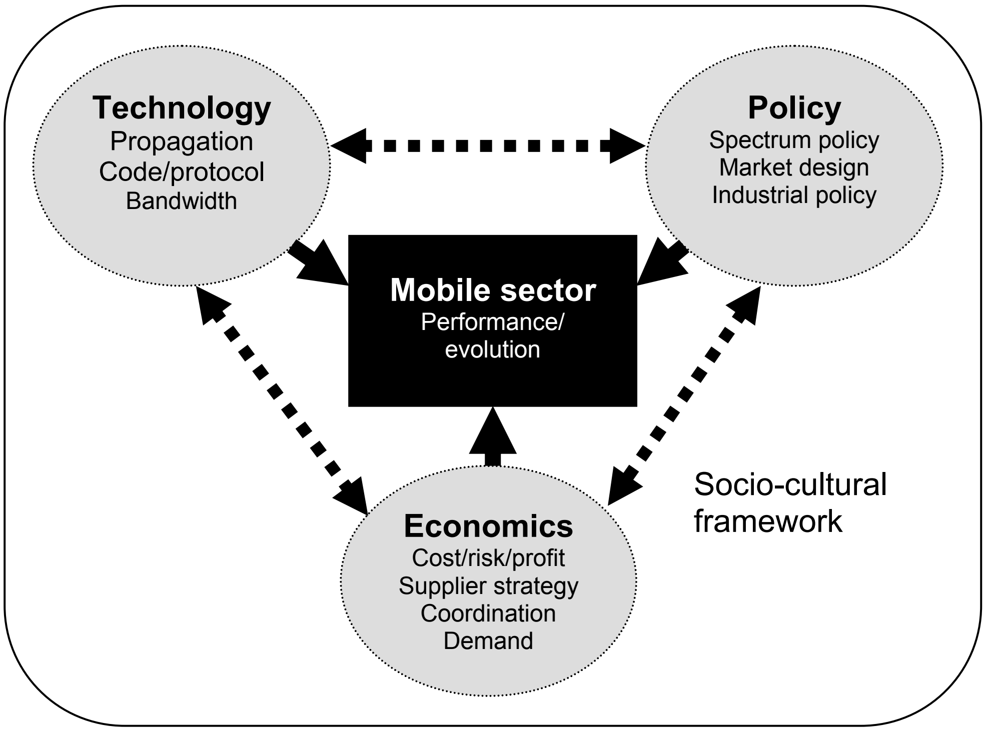
The tentative experience with mobile Internet access seems to indicate that these coordination tasks might be achieved more effectively if one company organizes the market players. For example, i-mode in Japan was in part successful due to the integrating role played by NTT DoCoMo. Likewise, Nate in South Korea benefited from the efforts of SK Communications, which coordinated handset manufacturers, network operation, and content provision. Both companies relied on the kiosk system to collect service revenues, at least for a select group of affiliated content providers, thus greatly reducing transaction costs for the user. It is reasonable to assume that mobile TV will likewise have a higher chance of success where these coordination and integration tasks will be solved more efficiently, either by one of the major players or by independent system integrators.

3.2 Co-evolutionary dynamics

Of particular interest is how these factors, which are largely under the discretion of the mobile network operators, interact with factors that are in part or fully external. It is this interaction that influences the rate and level of diffusion of services, the mix of wireless technologies and services available, the speed of innovation in wireless services including the transition to new generations of wireless services, and prices charged for services. Key factors that interact with the business strategic decisions of firms are technology (both the installed base and available alternative technologies), the legal and regulatory rules governing the provision of wireless services, and the market environment (both on the supply and on the demand side). These factors are linked by many feedbacks, which create high degrees of dynamic interdependence (see figure 1).

Co-evolutionary approaches are an innovative way of modeling such interdependencies. Two or more units in such a system are said to co-evolve, if they each have a significant impact on each other to persist (Murmann, 2003). Although earlier approaches did not use the notion of co-evolution, basic aspects of this framework are visible in theories of learning organizations (e.g., Senge, 1990), evolutionary models of innovation (e.g., Mowery and Nelson, 1999), and systems models for management and policy (Sterman, 2000). A main difference to these earlier theories is that co-evolutionary models explicate the process of dynamic changes in more detail by building upon recent developments of generic evolutionary models.

Figure 1: Co-evolutionary dynamics



Applied to the context of mobile communications services, it is first important to identify what the relevant sub-systems of the larger socio-technical systems are that co-evolve. There is no straightforward deductive way to determine these components. Rather, a choice has to be based on a detailed understanding of the history of the industry and its present structure. The ability to observe the development of the mobile industry in different, somewhat isolated, regions assists in addressing this issue as the effects of alternative institutional arrangements may be observed. Depending on the specific question, a co-evolutionary model might distinguish between fewer or more sub-systems. A basic approach is to differentiate three realms: technology, policy, and economic aspects (supply and demand-side conditions). The model could be expanded by unpacking the realm of firms to identify the different participants, including equipment manufacturers, network service providers, application and service providers, and portals. A key insight from co-evolutionary models is that events in one area affect (but do not fully determine) developments in related ones in anticipated and unexpected ways.

For example, spectrum policy choices (e.g., the amount of spectrum allocated, the assignment mechanism utilized ─ auctions, beauty contests ─, and number of licenses) have implications for the financial position of service providers and will, in turn affect their investment and service pricing choices. Where suppliers are constrained by market parameters, such as consumer's willingness to pay and the competitive situation ─ and thus cannot simply forward higher license acquisition costs into prices ─ the upfront sunk cost will have real effects. For example, sunk costs may reduce the willingness of network service providers to share revenues with application service providers and hence delay content production and consequently the diffusion of service. Other policy choices, such as the specific market design, the ability for incumbents to use existing spectrum for new services, or roll-out obligations, will also have effects. Likewise, the existing technology platforms will constrain the ability of service providers to deploy new features and services. Business decisions, on the other hand, will affect subsequent policy choices and the technology base. Jointly with other factors they shape the evolution and overall performance of the industry. The next section will illustrate these factors using South Korea as a case in point.

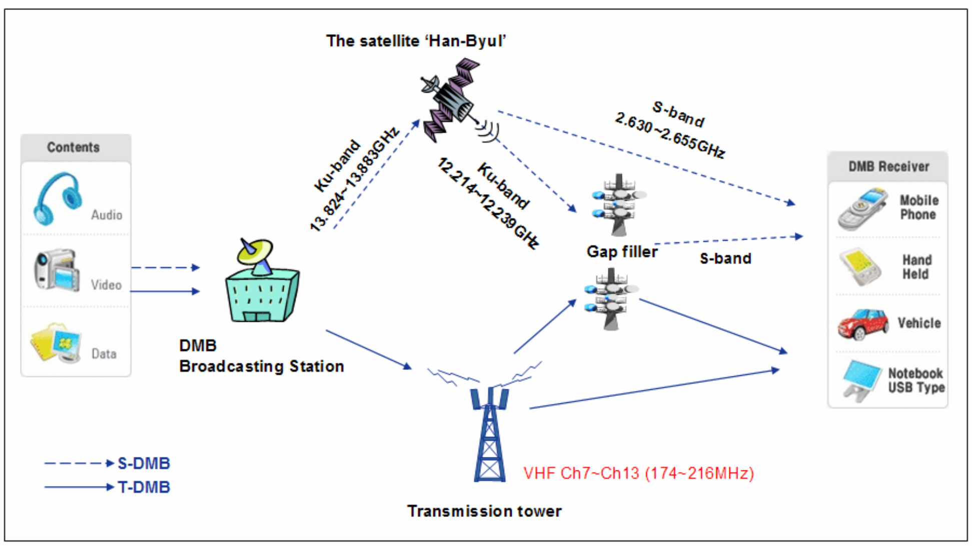
4. Mobile TV in South Korea

South Korea introduced the world's first handset-based mobile TV service in May, 2005 (Lee, 2005). For the past few years, it has consistently led in the development of innovative mobile services and technology. The country illustrates the co-evolution of technology, policy, and business choices but also the mistakes that can be made along the way. Apart from its own merits, the development of mobile TV in South Korea may therefore be instructive for other countries as well.

4.1 Technology infrastructure of mobile TV

Mobile TV in South Korea is delivered via S-DMB and T-DMB infrastructures (see figure 2). In the first case, a satellite broadcasting center uplinks multimedia content via a satellite frequency (Ku-band, 12-13 GHz). Content is downlinked to mobile devices using an S-band signal (2.630-2.655 GHz), allocated to DMB. As power output is not limited by international regulations, the S-band is well-suited for broadcasting to small handset antennas. T-DMB uses the VHF band III and the L-band, which had already been set aside for DAB. Multiplexed T-DMB uses only 1.5-1.7 MHz and is hence much easier to accommodate than the 6-8 MHz needed by DVB-H. To cover areas not reached by the S-DMB or T-DMB signals, a gap filler system of repeaters is used.

Figure 2: S-DMB and T-DMB infrastructure in South Korea



Like Japan, South Korea uses System-E as the S-DMB standard, which uses CDM, similar to the CDMA technology used in its cellular networks as particularly suited to the country's mountainous terrain. Moreover, Korea had achieved competitive advantages in components and technologies used in CDMA. T-DMB uses the Eureka 147 standard, which is backward compatible and allows using the DAB network and frequencies (OECD, 2007). When making these technology adoption decisions, policy-makers considered business as well as technology aspects. Criteria such as the cost effectiveness of the infrastructure, equipment, standards, and the relative competitive position of the mobile industry weighed in. Thus, policy decisions were closely linked to and co-evolved with technology and firm strategy.

4.2 Policy toward mobile TV

Public policy decisions shaped mobile TV in several important ways. Important industrial policy decisions were made by the Ministry of Information and Communication (MIC). Regulatory authority is vested in the Korean Broadcasting Commission (KBC) dealing with issues such as licensing, spectrum management, and competition among the service providers. In its early stages, Korean mobile TV has suffered from severe conflicts among players due to lack of a clear regulatory model for the converging broadcasting and communications services.

A mismatch between business and policy was visible in the process of *licensing* mobile TV. During the early stages of S-DMB development, SK Telecom (SKT), the leading Korean mobile service provider, who sought to boost ARPU in the face of a nearly saturated cellular market, exerted a major push. SKT signed a Memorandum of Understanding with Mobile Broadcasting Corporation (MBCo), the Japanese DMB service provider backed by Toshiba, to cooperate in the development of DMB. MIC insisted on an early realization of S-DMB to establish a first mover position on the global mobile TV market. In September 2001, it initiated international registration at the International Telecommunication Union (ITU) of a satellite service according to SKT's application. In contrast, KBC postponed its approval of S-DMB, reasoning that demand was insufficient and that fair competition with T-DMB needed to be ascertained beforehand.

Service was not launched until after the passage of the Broadcasting Law in March 2004, which suggested rapid introduction of S-DMB. KBC issued a request for proposals and despite the fact that there was only one application, TU Media, the joint venture between SKT and MBCo, KBC organized an evaluation committee of scholars, lawyers, experts in broadcasting and communication, and citizen groups. The committee selected TU Media as S-DMB service provider on December 14, 2004 after careful examination of the business plan, hearings and on-site evaluation. At that time, TU media had already invested substantial capital in launching a satellite ($97 million), the installation of gap fillers ($230 million) and the establishment of a DMB broadcasting center ($60 million) (SKT, 2007). TU Media started a pilot service in January 2005 and launched its full broadcasting service in May 2005. Shin (2006) argues that this process implies that Korean DMB has been developed by a leading mobile provider's technology-push to market and government initiative rather than by market- pull.

Another important issue that shapes the mobile TV market is the rules governing the *retransmission* of terrestrial TV programs via S-DMB. A conflict of interest exists because the terrestrial broadcasters, including KBS, MBC, and SBS, which were all given T-DMB licenses, directly compete with S-DMB. In its push for mandatory transmission rights, TU Media referred to a combination of business and public interest reasons. It argued that, first, terrestrial programs are public property and that viewers want to and should be able to watch these channels on S-DMB. Second, TU Media argued that retransmission should be allowed to secure fair competition between T-DMB and S-DMB. Third, it claimed that refusal to retransmit would depress the profitability of S-DMB with negative repercussions on program providers and manufacturers (TU Media, 2005). KBC left the issue to contractual agreements between providers, which, so far, have not been signed by terrestrial TV companies.

A third important policy dispute was whether or not to allow T-DMB, like S-DMB, to offer *pay service*. The fees for S-DMB cover the costs of the satellite infrastructure as well as the gap fillers. T-DMB argued that, at least initially, advertising revenues would be too fragile and volatile to cover the costs of gap fillers and other start-up expenses. T-DMB service providers wanted to offer premium services, tailored to the different tastes of users, for pay in addition to free basic services. This two-tier business model was to generate additional profits for T-DMB operators (DMB Portal, 2007). However, users wanted to maintain T-DMB as a free service, because mobile TV is an expansion of free over-the-air broadcasting for home viewers and it is using very high frequency (VHF) channels, which are regarded as a public asset (OECD, 2007). Therefore, until now, KBC has experienced difficulties in finding solutions to the T-DMB cost problem. It implies that the profit structure of industry could be changed according to how policy for competition is set up.

4.3 Business aspects of mobile TV

The evolution of the mobile TV market is also influenced by factors on the supply and demand side of the market, which are in turn shaped by policy decisions and technology. S-DMB and T-DMB have very different cost structures. According to MIC, S-DMB will require a total investment of $500-800 million. As T-DMB will mainly have to invest in a gap filler infrastructure, its costs are lower, estimated in the range of $50-80 million. The cost of content need to be added to the investment expenses. However, like other information businesses most of the cost is an upfront fixed, possibly sunk, cost, whereas the incremental costs of serving an additional user is very low.

From a consumer perspective, several important differences exist between the services. T-DMB is free of charge but offers only a lower number of channels and, so far, only regional coverage. S-DMB is priced at $13 per month and offers a higher number of channels and national coverage. The business decisions of service providers in both platforms are highly interdependent and co-evolving. In South Korea, the large number of commuters, attitudes that favor new technologies and devices, and public policies in support of new technologies, create favorable market conditions. Nonetheless, market demand for S-DMB lags behind initial expectations. TU Media has only signed up about half of the 2.2 million subscribers needed to reach the short-term break-even target. TU Media expects 6.6 million subscribers by 2010 but there are many contingencies to this forecast.

One is the pricing policy of T-DMB operators, who would like to introduce some form of payment. Options include a monthly flat fee, per channel fees, or charges for specific content. Another factor is public policy, such as the rules governing retransmission of terrestrial programs via S-DMB. This issue will be repeated when South Korea introduces other convergence services as is already visible in conflicts with regard to IPTV and Wibro. Presently, S-DMB and T-DMB are imperfect but nevertheless strongly interdependent competitors. How competition will shake out will depend on future technology developments, the future public policy regime, and business decisions. Given the present market structure and market conditions, some form of consolidation seems unavoidable or at least integration of mobile TV into a broader range of services. Both broadcasters and SKT are in a position to bundle mobile TV with other services, although SKT seems to be in a slightly better position. At the beginning of 2007, thus, the South Korean mobile TV market is thriving in terms of technological solutions but facing continued financial difficulties.

5. Lessons and outlook

The theoretical framework and the experience in South Korea illustrate the conditions under which mobile TV may develop and the possible trajectories along which the market segment may evolve. There are noticeable economic and technological differences between the various mobile TV platforms, giving operators several options to deploy service. In-band transmission does not require new terminals nor network infrastructure. Unicast approaches may eventually run into capacity limits and cause high opportunity costs. However, this problem might be defused or even overcome with multicast solutions. Broadcast transmission does require new handsets and a dedicated broadcast infrastructure.

In some countries, frequencies in the range used by DMB are not assigned to that service, blocking the development of DMB. In these countries, other platforms, such as MediaFLO will likely be deployed. The market structure will also be shaped by rules determining which established players (e.g., broadcasters, mobile network operators, or content providers) will be eligible to obtain a license in terrestrial and satellite-based services. Giving different stakeholders competing licenses may cause prolonged stalemate unless clear rules are developed as the retransmission issue illustrates in South Korea.

The revenue model adopted by service providers (fee-based, advertising-based) will also influence the diffusion of service in the market. Given the cost structure of mobile TC, it may well be that the presence of a free service will undermine the ability of a pay service to break even. Providers who are able to bundle mobile TV with other convergence services may thus enjoy competitive advantages. The relative competitive advantage of service providers will also be affected by the rules governing equipment certification and network openness. In nations that have adopted one standard and consequently have fairly open equipment markets, it will at least in principle be easier for competing service providers to challenge in-band mobile TV. In contrast, in nations such as the U.S., with a strong position of the mobile service provider in equipment certification and with limited openness of mobile broadband networks, one would anticipate that mobile service providers play a stronger role. The overall market evolution will also be shaped by the development and adoption of vodcasting and solutions like Sling Media.

Lastly, as the experience in 2.5G and 3G mobile data service illustrates, the evolution of the market will also be influences by socio-cultural factors that may be largely outside the control of any actor. For example, the attitudes of consumers toward new technologies and services will be important. Likewise, in nations with a stronger tradition of collaboration between public and private and among private players, the coordination tasks of mobile TV may be easier addressed. In contrast, in nations or regions that are more strongly rooted in competition and market-driven solutions, these tasks may be addressed slower and perhaps with a larger number of failed experiments and hence businesses that will leave the market or be absorbed by other players. However, from a dynamic efficiency point of view, such a learning model may show superior innovation performance.

Which approach (or which approaches) will result in sustainable sector configurations will remain to be seen. The most advisable approach for public policy is to eliminate known obstacles to the deployment of mobile TV (such as lack of frequencies) and allow the highest rate of institutional and business experimentation.

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