

Mobile TV – Service Design Strategy

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J O H A N E N G L U N D

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Abstract

Many actors in the established telecom and media industry are hoping that mobile TV will become a future killer application and prosperous new source of income. There is however some major obstacles left before this could become reality. Questions around what customers actually want, which technology solution is the best for mobile TV, how the business value chain must look behind the service etc. are still unanswered.

This thesis sets out to answer these questions and give a strategic overview of the obstacles and factors that will affect the future uptake among customers. In order to analyze the future of mobile TV services one must start to look at the user expectations and market requirements. Mobile users and customers expect services that are easy to use and supply content that is familiar to the user from traditional TV at home. The overall experience must be appealing, easy to access wherever the user is and not too expensive. Furthermore the market, consisting of content providers, aggregators, distributors etc., requires that a technological standard is set and that someone, mobile network operator or broadcaster, builds and deploys a working service. This service needs to support effective content protection, billing of the customer, access control and tracking functionality for advertisers. In order to achieve the first deployment some major issues need to be solved concerning the technology for distribution infrastructure.

The overall problem is not the quality or capacity of the available technologies but rather the complex question of who will pay for, use, own and control a mobile TV network. At present there are still a lot of issues to solve regarding technology standards, service packaging, business models etc in order to make the actor network invest together and develop a complete service package that customers actually are willing to pay for.

Two future paths and scenarios are the most prominent, one where mobile TV is broadcasted mainly over a dedicated broadcast network similar to traditional TV today. The other is a solution that uses the existing mobile networks that with some upgrades could support a “broadcast-like” service. The technology most suitable for broadcasting in Europe is DVB-H, developed and supported by Nokia among others. The technology has major advantages and great support on the market and in the EU administration. When it comes to re-using mobile networks, the Ericsson supported technology MBMS seems to be the most appealing solution today.

The two concepts are fundamentally different in a technological view but from a user and customer perspective the service will be perceived in the same manner. This is why it is very important to address the content and usability issues of the mobile TV service, ensuring an appealing service that people can use and like to use. If actors can cooperate on these issues, mobile TV has a real opportunity to become a future killer application of mobile handsets.

Index terms: mobile TV, DVB-H, MBMS, spectrum, strategies, technology marketing

Strategi för utformning av mobila TV-tjänster

Sammanfattning

Många aktörer på den etablerade medie- och telekommarknaden hoppas på att mobil TV ska bli nästa stora tjänst och en viktig framtida inkomstkälla. Det återstår dock en hel del frågor att besvara innan denna dröm kommer att bli verklighet. Frågor kring vad kunden egentligen vill ha, vilken teknik som är bäst lämpad för mobil TV, hur affärsmodellen och värdekedjan ser ut med mera är än så länge högst osäkra.

Den här uppsatsen har för avsikt att besvara, eller åtminstone ge en större insikt dessa frågor och ge en strategisk överblick över de faktorer som påverkar den framtida framgången för mobila TV-tjänster.

För att kunna analysera mobil TV måste man börja med att titta närmre på vilka förväntningar användarna har på tjänsten och vilka krav marknaden ställer på den. Mobilanvändare förväntar sig att tjänsten ska vara lätt att använda och erbjuder material som känns igen från traditionell TV. Den övergripande känslan av tjänsten måste vara tillfredställande, lätt att få tillgång till oavsett var användaren är samt inte vara för dyr. Vidare ställer marknaden, bestående av innehållsleverantörer, aggregatorer, distributörer med flera, krav på att en standard sätts snarast och att någon, mobiloperatör eller TV-bolag, utvecklar en fungerande tjänst eller plattform för mobil TV. Den här tjänsten måste stödja effektivt kopieringsskydd, fakturering av kunder, kontroll av tillgång till material samt någon form av statistik över användning för annonsörer. För att få till stånd en första lansering av marksänd mobil TV via dedikerade broadcastnät, måste en rad frågor kring teknik och frekvensspektrum lösas.

Det övergripande problemet är inte kvalitén eller kapaciteten hos de tillgängliga teknikerna utan snarare den komplexa frågan kring vem som kommer att betala, äga och kontrollera ett distributionsnät för mobil TV. I nuläget återstår en rad frågor att lösa för att hela aktörsnätverket tillsammans ska inverstera och utveckla en tjänst som slutkunderna faktiskt är villiga att betala för.

Två framtida scenarier utkristalliserar sig snart, ett där mobil TV sänds via ett marksänt nät liknande hur traditionell TV sänds idag. Det andra är en lösning där existerande infrastruktur för mobiltelefoni används, med vissa uppgraderingar, för att skapa en känsla av TV i traditionell mening. Den mest troliga tekniken för marksänd mobil TV att slå på bred front i Europa är idag DVB-H, utvecklad och med starkt stöd från bland andra Nokia. Tekniken har några framstående tekniska fördelar och starkt stöd på marknaden samt inom EU. När det gäller det andra alternativet att återanvända existerande mobilnätverk, framstår Ericssons teknikuppdateringar MBMS och HSDPA som de mest tilltalande lösningarna idag.

De två ovanstående koncepten är fundamentalt olika ur ett tekniskt perspektiv men tjänsten uppfattas ur kundens eller användarens synvinkel som densamma. Det är därför det är extra viktigt att lösa frågorna kring innehåll och användbarhet för att skapa tjänster som folk kan och vill använda.

Om aktörsnätverket kan finna vägar att samarbeta kring dessa frågor finns det stora möjligheter att mobil TV kommer att bli en "killer application" för mobiltelefonen.

Preface

This master's thesis was written as the final part of a Master of Science Degree in Media Technology at the CSC institution, School of Computer Science and Communication, at the Royal Institute of Technology. The work was a part of the research project "A Tele-economic study of mobile TV", a joint research project with the Centre for Information and Communication Research at Stockholm School of Economics and Wireless@KTH.

I would like to take the opportunity to thank my supervisor, Dr. Christopher Rosenqvist for his insight and support throughout the writing of this report. Also I would like to express my sincere gratitude towards my fellow research assistants during the project; Claes Grufman, Eddie Gustavsson, Jan Björk and Daniel Glasman, for your efforts and support throughout the project. I will remember the times of hard work, creativity and laughter in Zarko's Den.

Finally, I would like to thank all the people that attended our workshop in November 2006, helping us gather all the important data and feedback needed to complete this study.

I hope you enjoy reading this thesis!

Johan Englund
Stockholm, May 2007

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Abbreviations

ARPU	Average Revenue Per User
ASO	Analog Switch Over
DMB	Digital Multimedia Broadcast
DRM	Digital Rights Management
DTV	Digital TV
DVB-H	Digital Video Broadcast Handheld
DVB-T	Digital Video Broadcast Terrestrial
EDGE	Enhanced Data Rates for Global Evolution
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
HSDPA	High-Speed Downlink Packet Access
MBMS	Multimedia Broadcast and Multicast Service
MHz	Megahertz
MNO	Mobile Network Operator
R&D	Research and development
UMTS	Universal Mobile Telecommunications System

A more extensive glossary is found in the appendix.

1. Introduction

This chapter gives an introduction to the subject with the purpose and goal of this thesis, the recent development in the business and a background to the research project.

This thesis aims to identify how mobile TV services need to be designed and developed in order to succeed in the fierce competition on a local market. To find the winning service design for mobile TV, there are some key areas that need extra attention. The ambition for this thesis is to study the factors behind development of new technology that affect the outcome and popularity of new products or services. Focus will be on the need and behaviour of consumers and to translate these into user requirements that need to be met to create an attractive service. The goal is to evaluate different alternatives for distributing mobile TV and attempt to propose an optimized design for a “winning” service offer.

Indications from the actor network show that there will probably be a mixed environment of broadcasted and streamed content (IVA seminar November 2006) over mobile TV. In this new and still uncertain situation it is interesting for different industry actors to be able to easily overview and choose the best solution for their purpose, market, content and budget. It is also important to be oriented in the different technologies as the standardisation war on mobile TV is widely debated at the moment, both nationally in Sweden and Scandinavia as well as internationally.

The area of new technology adoption has been of great interest the last few decades due to the rapid development and introduction of new, digital technology that we today take for granted, e.g. the cell phone or mp3 players. Methods and theories on how consumers behave and adapt to new technology is the foundation to this report and can be generally applied to any new technology, although in this case it is well illustrated by mobile TV.

Mobile TV is interesting for many reasons, one because it involves a great number of actors both in the traditional media and telecommunications but also entirely new actors that spawn from the convergence of media forms and the switch from analogue to digital technology. Add to this that the medium, when this report is written, still is at a very early stage of development, making it possible for early movers to have an impact and shape the development of tomorrow’s mobile TV services.

The analysis is for practical reasons delimited to the Scandinavian region. Special attention will be given the Swedish market and Stockholm in particular, due to the close geographical distance from the author, the innovative spirit in this region and the fact that it is the most highly crowded area in Sweden, making it a the biggest potential market in the country.

Target audience for this thesis is mainly representatives for the media and telecom industry, with interest in new media technologies and business development. It is also useful for academics in the same area. Some basic prior knowledge in mobile systems, data communication, TV/video technologies and business models is helpful to fully appreciate this report.

The document is structured to begin with an Introduction to the research problem and the overall development in the media market that has led up to introduction of mobile TV. Second is a Strategic Overview to give a deeper understanding in the three major areas of interest; End-user expectations, Market Requirements and Available Technologies. The third part is a presentation of the results from the Workshop with a following analysis. In the end, there is a Conclusion to the research with Strategic Recommendation.

1.1. Problem definition

Overall research question for this thesis is:

- **How does future mobile TV services need to be designed to achieve a high level of adoption among customers?** What factors affects the adoption of mobile TV services?

Since this a very broad question with a complex number of factors involved, it should be supported with the following sub-questions:

- **What is Mobile TV, really?** Define the mobile TV service. Is it traditional TV on a small screen, on-demand services or a mix of the two? Maybe something entirely different?
- **What different technological solutions are available for mobile TV today?** What are the **pros and cons** of the different alternatives?

1.2. Background

1.2.1. Convergence, divergence and digitalization

In the ever changing world of media, the conditions on the market constantly change, affecting everything from the economy, technology, production, content, distribution to consumption and even the democratic process within the whole society¹. This phenomenon can be described as convergence, when different forms of media come closer together and sometimes merge together and form “new” media. The convergence is often due to technological development but can also spawn from changing economical conditions that is a reality for many media firms today. According to Hvitfelt (2005) there are four types of convergence:

- *Net convergence* – channels intended for a specific type of service now can be used for other services.
- *Device convergence* – different services can be consumed with the same device. Also present in the producers line where different content can be produced using the same computer.
- *Service convergence* – different types of content and services blend together.
- *Market convergence* – markets merge together. An example of that are net operators starting to produce their own content for their channels.

Convergence is often caused by the introduction of digital technology, where content is produced, distributed and finally consumed entirely in digital form. An extreme form of media convergence is homepages on the Internet where different forms of media like text, audio, images and video are all available through the same interface.

The convergence of media is to be considered more a process rather than a state. It does not have a beginning or an end. The opposite of convergence, divergence, is also an equally important factor. Hvitfelt points out three areas where the convergence in media is strong:

¹ Hvitfelt et al 2005

- *Business and markets* – there is a convergence in owning and control of distribution of media, resulting in fewer companies having more influence and control over the market. Large conglomerates are formed and a few of these controls a large majority of all media. The convergence has effects inside the company as well, making the border between editorial and advertising staff thinner. The thresholds becomes lower making it easier for new companies to start cheaper and more efficient businesses resulting in increased competition on the market.
- *Technology* – converging technologies affect all processes in the media, from production to consumption. The digital networks can distribute all forms of media and new devices are developed for customersthat can support all of these in one single device. At the same time other devices are developed to support specific media or distribution forms.
- *Content* – convergence in content happens when the same raw material is used in different forms of media, making the content more or less similar in all channels. On the other hand is the opposite development, divergence of content, strong in the new digital era. New interactive and personalized content is increasing in popularity and user-generated content find new forms of distribution over the Internet. Theme channels and special news papers are taking over the older one-to-many broadcasting model where media provided a little bit for every one. The development can be described as an individualization and fragmentation of the audience, content along the long tail². This is clear in television where this media form is developing towards theme channels rather than broad, general channels with a little of everything.

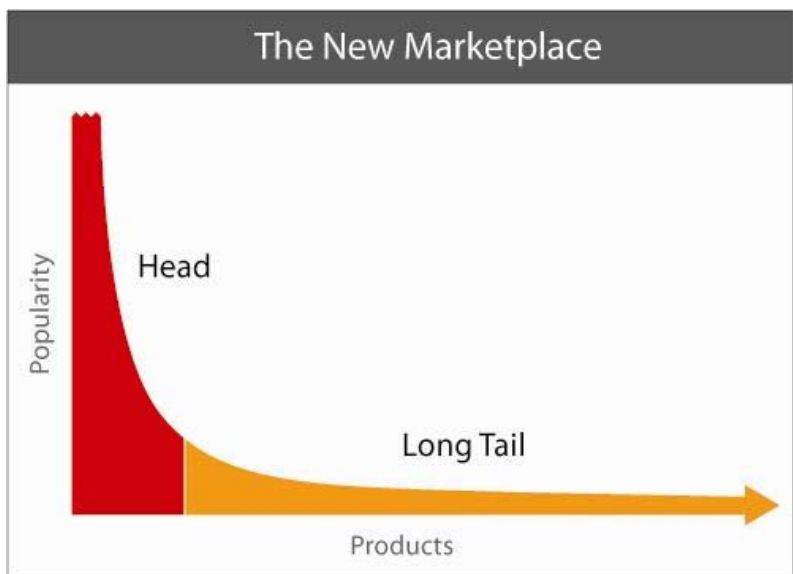


Figure 1: The Long Tail, the divergence of content now makes it profitable to produce further along the tail.

Convergence is affecting the whole media system, both established and new media. Service offers and media consumption are diverting and replacing the old mass media with specialized and interactive media that are personally packaged for each individual customer. So convergence and divergence are different sides of the same coin. This development is also not likely to stop; it is the beginning of a new era in media, rather than the end.

² Anderson 2004

³ Anderson 2004

1.2.2. Internet goes mobile using 3G and the analogue switch-over

During the last decade, mobile services have undergone a massive evolution from basic point-to-point voice service to rich multimedia content. This development is much due to the convergence between two distribution networks, the Internet and mobile telephones⁴. While network operators are rolling out their third generation networks and infrastructure, the demand for more complex services have grown among the customers and this has quickly become a promising possibility to attract new customers. We have already seen new rich content in the form of streamed video clips, ring tones and games and the market is now ready to take another big leap in the service development, aggregated video content distributed in channel format, similar to traditional TV. This service can be provided in two ways, either by use of the cellular networks (2G/3G) or by use of dedicated broadcast networks, similar to the delivery of traditional TV. The development have made TV content available outside our homes and market actors are hoping to expand our overall media consumption and create totally new business opportunities⁵.

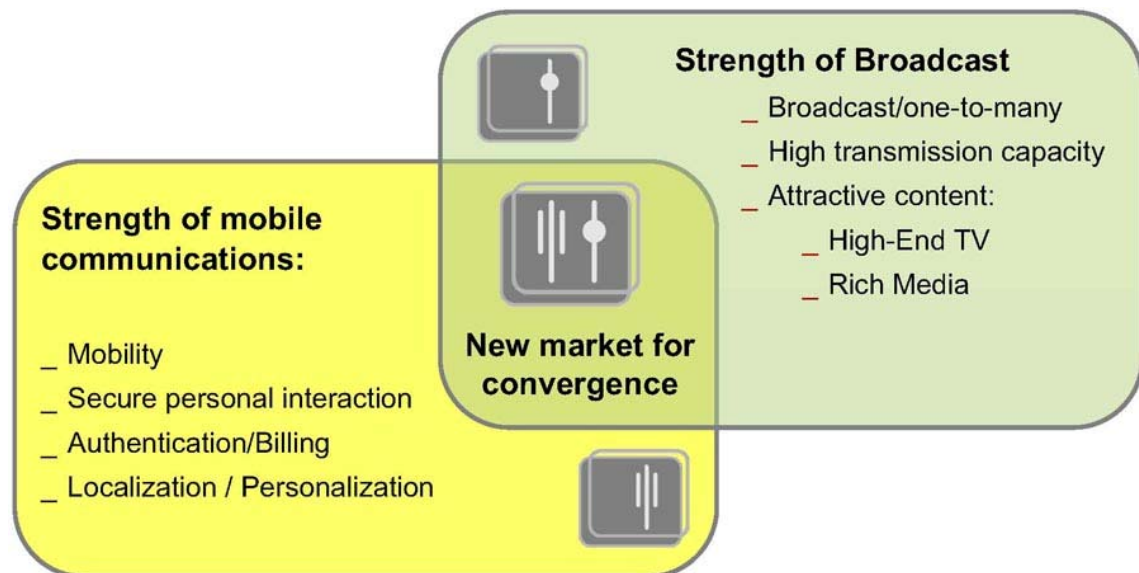


Figure 2: The new market for converging services, combining the strengths of mobile communications and broadcast TV.

The ongoing switch to Digital Terrestrial TV (DTV) in Europe and the rest of the world is also an example of technical convergence where digital technology is introduced in a traditional media. Not only is digital TV much better in sound and image quality, it also enables interactivity, personalization and other new services, all adding value for the customer. Possibly even more important is that by using digital broadcast technology, frequency spectrum is used more efficiently that enables use of free spectrum for new services. This free spectrum is crucial for any new wireless application since it is the “media” needed to distribute content to the customer. When the analogue switch-over is completed in Europe sometime around 2012, there will be a large amount of free spectrum available for new services and the question now being raised, even at a EU level⁶, is what to really use it for? The most commonly suggested services are mobile broadband, High Definition TV (HDTV) and mobile TV.

Although mobile TV services are at present in their infancy in most countries, most predictions seem to be positive concerning growth. However, a number of issues

⁴ Heickerö 2003

⁵ Sattler 2006

⁶ Reding 2007

remain unclear concerning the mobile TV technologies, industry strategies, and market development. This uncertainty, naturally, also concerns the links between the three.

Firstly, as regards the underlying technologies there are still uncertainties connected to the relationships (competition, complementarities, capacities) between streaming and broadcasting mobile TV technologies and standards, and between the different technologies within each of the two groups. Technology uncertainties also concern future adaptation needs, given a fairly rapid take-off of user adoption of new mobile TV services.

Secondly, against the background of these emerging technologies and uncertain market behaviour, there are presently many uncertainties concerning the future market positions and strategies of: technology suppliers, mobile service operators, TV broadcasters, service content providers and others, all aiming for a stable position in the new, emerging constellations of firms involved in developing and distributing mobile TV services.

Thirdly, despite the high expectations concerning market demand and growth, little is presently known about customers' demands and behaviour towards mobile TV services. Trials in Finland, England, Spain, France, Italy, and Norway, have indicated some commonalities⁷: consumers generally prefer simplicity and high usability, mobile TV services should show high technical functionality and accessibility, content should be adapted to short periods of viewing time, and complementary mobile services should not be negatively affected by the TV services. Although customer data from test trials exist, there remain a number of uncertainties concerning future market and consumption behaviour: short vs. long programs, overview vs. width of program supply, regularity vs. non-regularity in the timing of consumption, content and payment preferences, and more. What will the "offering" look like, will it be specially developed "mobile TV services", or "regular TV services adapted to mobile streaming and broadcasting"?

This paper aims at giving a broad overview of the different service concepts of mobile TV, identifying the major aspects to consider in the process of launching mobile TV services. There are numerous alternatives and solutions available on the market, all with their own advantages and drawbacks. In order to choose the most suitable solutions, actors like mobile network operators, TV channels, content providers etc. can get an overview of the best solutions for their specific situation.

1.3. The research project

This thesis is a part of the research project "A Tele-Economic Study of Mobile TV" where the main aim is to study the emerging system for mobile TV services, linking technology, strategy and market behaviour. An important part of the objective of the study is also to create new forms of collaboration between Wireless@KTH and Center for Information and Communications at Stockholm School of Economics, including the exploration of contacts with new industry partners (e.g. in the media and TV broadcasting industry). The study is explorative, in the sense that it aims to generate areas for future, joint techno-economic studies, investigating different empirical areas and research methods for future techno-economic research, and also to explore new forms of future research funding.

The ambition is to include and integrate both technical and economic aspects in all of these studies. The term "economic" in "techno-economic" include both customer, market demand and behaviour aspects, and secondly, strategic, industry behaviour aspects among the involved firms. Linking the uncertainties in technologies, industry

⁷ BMCO 2006

strategies, and market behaviour, a number of important issues are raised. The project will focus on all three areas and aims to link them.

A predicted result of the suggested project is the strengthening of intra-disciplinary and inter-disciplinary research activities in the wireless area. The aim is to create a project that connects KTH and SSE research strengths (technology and economy), running cross-disciplinary research projects in cooperation with industry partners, and between academic institutions. Mobile TV services and technologies have a large potential impact on future wireless systems, and both ICT industry and media industry development. Increased insights into these new technologies and a selection of service application areas are of common interest to SSE and KTH researchers, and to industry partners in supplier and user related industries.

The studies are performed in joint cooperation between CIC at Stockholm School of Economics (SSE) and Wireless@KTH. CIC with Wireless@KTH are jointly responsible for outlining the studies of the project. The main empirical work is performed by SSE and KTH researchers, including students (“ex-jobb”). Per Andersson and Christopher Rosenqvist acts as SSE research leaders (part time) in the project. Wireless@KTH acts as research coordinator jointly with SSE in the project. Main participants from Wireless@KTH are Östen Mäkitalo and Aurelian Bria.

A tentative work plan for the research project for the period October 2006 - June 2007:

Step 1: Oct-Nov 2006	Empirical data collection S1 and S2, S3: pre-studies
Step 2: Dec-Jan 2006	Analyses and draft proposals S1 and S2, S3: outline of S3 analyses
Step 3: Jan-Apr 2007	Finalising S1, S2 and S3
Step 4: May-June 2007	Concluding analysis S4, project reports and articles, presentations

1.4. Summary

- Main research question for the thesis is: How does future mobile TV services need to be designed to achieve a high level of adoption among customers?
- The convergence within current media affects the whole value chain and sets the rules for actors on the market. Both opportunities as well as threats are constantly forming. Digital technology makes any kind of media available anywhere at any time, personalized and interactive.
- This thesis is a part of the research project “A Tele-economic Study of Mobile TV”, a joint research project aiming at bringing technical and economical research closer together in collaboration with business actors.

2. Method

This chapter introduces the most common and widespread research methods for predicting and measuring user acceptance and uptake of new high-tech products and services. It also explains the approach for the practical work that needs to be conducted in order to answer the research question.

2.1. Theories

When dealing with high-technology products and services, it is of the outmost importance to have a consumer and business point-of-view in the entire development process in order to reach out to a broader audience than the early adopters⁸. Traditionally, telecom operators, infrastructure builders and handset vendors have focused their research and development (R&D) organization on producing new technology at a high rate without having a clear market or application for it beforehand. R&D actions were focused on creating as large portfolio of different technologies and services as possible so that customers could choose from a huge “smorgasbord” of high-tech services. Innovation work was more focused on increasing bandwidth or capacity than finding clear applications that actually enhanced the customer’s experience. In doing so, they often found themselves providing a product or service that customers did not want to use or pay for. However there is extensive research in the area of what factors or parameters that makes a product ‘flop’ or ‘flip’, one of them is the Innovation Diffusion Theory (IDT).

The Innovation Diffusion Theory was introduced as early as 1962 by Everett M. Rogers and later refined in 1995. The theory is popular in studies of user adoption of innovations in specific target groups and can be applied to use of technology as well as new ways to act in general. A part of this model is also the Innovation-Decision Process which covers this five-step sequence⁹:

- Knowledge – learning about the existence and function of the innovation
- Persuasion – becoming convinced of the value of the innovation
- Decision – committing to the adoption of the innovation
- Implementation – putting it to use
- Confirmation – the ultimate acceptance (or rejection) of the innovation

Roger defines five categories of adopters, classified depending on their innovativeness (their presence in an average social system) and common characteristics:

- Innovators (2.5%) - venturesome, educated, multiple info sources, greater propensity to take risk
- Early adopters (13.5%) - social leaders, popular, educated
- Early majority (34%) - deliberate, many informal social contacts
- Late majority (34%) - skeptical, traditional, lower socio-economic status
- Laggards (16%) - neighbors and friends are main info sources, fear of debt

⁸ Rogers, 1983

⁹ Rogers 2003

Within a social system, a group of individuals with certain common grounds interact with each other over time, defining the boundaries within which an innovation can spread. The innovators are the first to adopt to new habits and by new products, much because the newness it self appeals to them. Innovators (and early adopters) play an important role in the spread of an innovation, although Rogers emphasises that there is nothing wrong with being a laggard. Resistance to innovation may be entirely rational from the laggard's point of view, for example of economical reasons.

Rogers also points out that innovation often is not viewed singularly by individuals but instead they may be perceived as an interrelated bundle of new ideas. The adoption of one idea may trigger the adoption of others¹⁰.

Crossing the Chasm, Geoffrey A. Moore

The differences between the categories of adopters are defined by Moore (2003) as "cracks in the bell curve". He argues that there is a chasm between the early adopters of the product and the early majority and believes that visionaries and pragmatists have very different expectations. This chasm needs to be bridged if an innovation is going to be successful in the mass market.

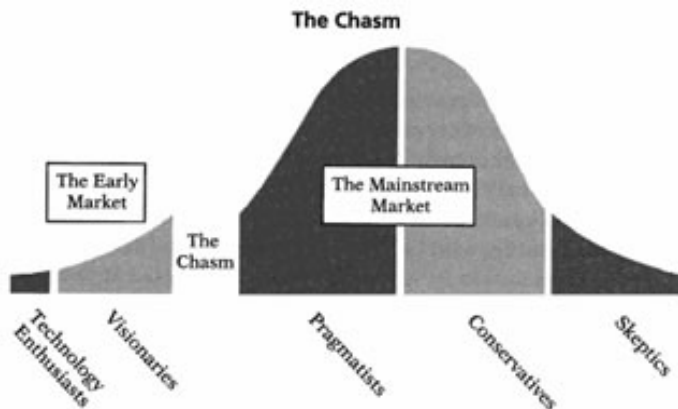


Figure 3: The chasm in the Roger Bell-curve, the gap between early adopters and early majority that according to Moore needs to be crossed for a new technology to be successful.

His suggested technique to cross the chasm includes:

- Choosing a target market
- Understanding the whole product concept
- Positioning the product
- Building a market strategy
- Choosing the most appropriate distribution channel
- Pricing

Moore extends Rogers' work on the Innovation Diffusion Theory and the five main segments are recognized; innovators, early adopters, early majority, late majority and laggards. However, Moore's theories are only applicable for disruptive or discontinuous innovations. Adoption of continuous innovations (that do not force a significant change of behaviour by customer) are still best described by Roger's theories.

¹⁰ Kaasinen 2005

Hype Cycle of technologies, Gartner Research

New emerging technologies tend to have a high profile in the media and public debate compared with more mature technologies, which often leads to over inflated expectations. The Hype Cycle, by American research house Gartner, is a graphical representation of the maturity, adoption and business application of specific technologies. Each technology's Hype Curve is different depending on the technology's perceived importance in the business and society.

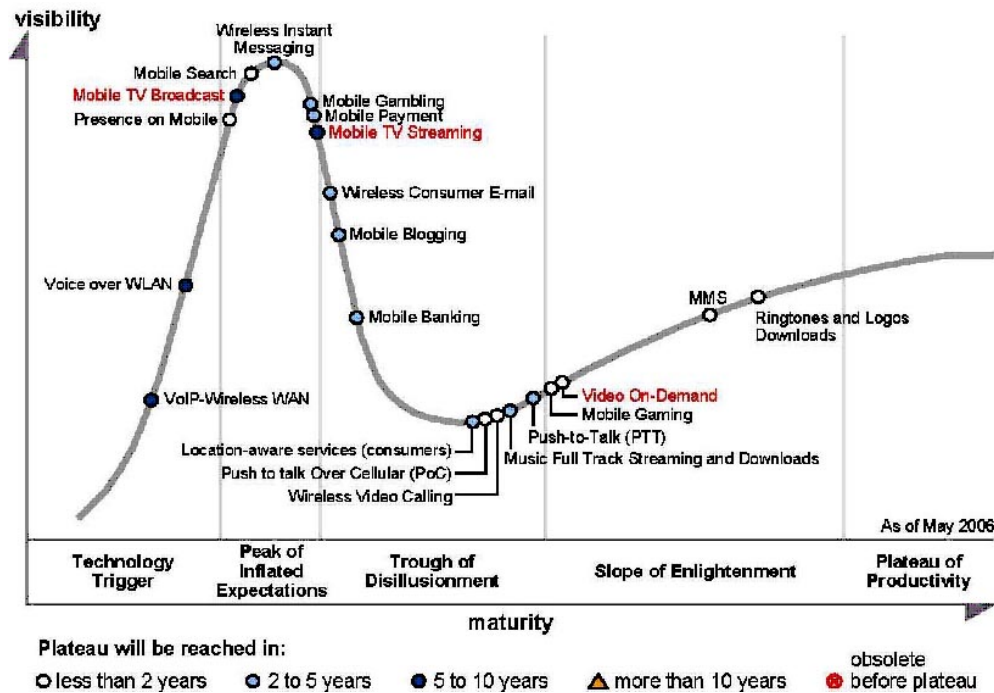


Figure 4: Hype Curve of mobile services, showing where mobile TV services are at present. Video on-demand services should have a promising future after period in the Trough of Disillusionment, while mobile TV streaming just entered the same.

As the Figure 4 shows, the Hype Curve consists of five steps:

1. *Technology trigger* - a breakthrough, public demonstration, product launch or other events generate significant press and industry interest.
2. *Peak of inflated expectations* - over-enthusiasm and unrealistic projections result in some successes but more failures, as the technology is pushed to its limits.
3. *Trough of disillusionment* - because the technology does not live up to its inflated expectations it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
4. *Slope of enlightenment* - focused experimentation and solid hard work by an increasingly diverse range of organizations lead to a true understanding of the technology's applicability, risks and benefits.
5. *Plateau of productivity* - the real-world benefits of the technology are demonstrated and accepted. The final height of the plateau varies according to whether the technology is broadly applicable or benefits only a niche market.

2.2. Approach

This part describes the practical approach to how the thesis work will be conducted. The three step plan introduced and the over-all problems with the suggested approach.

2.2.1. Three steps

1. Pre-study: Identifying parameters and overview of the problem through literature studies, interviews and seminars
2. Data collection: Extracting and assessing key parameters in a workshop with stakeholders
3. Analysis: Assessing possible service designs, outlining possible scenarios of “winning” services

To be able to answer the research question; how successful mobile TV services needs to be designed, one must take a number of aspects into account. The first step is to define mobile TV as a medium, what are its specific characteristics. This can be extracted from technical literature and documentations found on the Internet where experts and journalists give their view and definition to the concept.

The next step logical step is to start at the end, with the customer and end user by analysing early trails (tests with different mobile TV solutions) and reports on user requirements for mobile TV, from Sweden and internationally. Complementary input can also be extracted from a market and content analysis in order to get a multiple view on the service requirements. The main method in this will be to triangulate facts and thoughts from representatives from the whole actor network in order to get as reliable data as possible.

Before doing the assessment a thorough inventory of available and relevant technologies, and the organisations behind them, is done. The different solutions is sorted into two categories; broadcast and streaming. The assessment is presented in a relative comparison of the capabilities so the properties of each technology are visually presented and easy to overview. The result will be the best service design path for a mobile TV service, for different actor perspectives.

The process of designing new products and services is interesting in a general perspective. The consumer-centric approach to developing new technology is a relatively new and not widely implemented theory that is gaining more and more support. In other words is the method of developing mobile TV services widely applicable on other innovations within the New Media area.

2.3. Method complexity

2.3.1. Qualitative over quantitative

There are mainly two ways for approaching research problems: (1) quantitatively, which means studying phenomenon that can be described in numeric values, and (2) qualitatively, which means focusing on the characteristics or quality of something. Quantitative researchers normally favour an experimental approach in which they try to systematically observe changes in the phenomena of interest while they manipulate what they believe to be causal influences. Researchers using qualitative methods may be more concerned with the individual's personal experiences of the problem being

evaluated. The choice of method is strongly related to the problem at hand and in this case a qualitative approach is most applicable.

The main data collection instrument in a qualitative study is often the researchers themselves. Obviously, since qualitative studies often involve both human subjects and researchers, they are normally sensitive to bias. For example, a friendly and close relationship between the researcher and his or her subjects may encourage trust and hence benefit the study as a whole, but may also influence the results. It is crucial that personal relationships and expectations are not allowed to confound the data collection.

This study will have a qualitative approach since the area of interest is not well developed and many factors revolve around thoughts, ideas and in many cases, wild guesses from industry representatives. Strength in this survey is that the author is still not attached to any industry alliances and the research project in whole is conducted by more or less industry in depended organizations.

2.3.2. Reliability and validity

Reliability and validity are two ways of evaluating research. A user study or experiment that yields consistent, stable, and uniform results over repeated observations or measurements is considered reliable. Validity concerns the accuracy of the study or experiment. A study that measures what it is supposed to, in accordance with its fundamental purpose, is valid. In qualitative studies, the concepts of validity and reliability may have to be adjusted to the fact that these studies normally are not concerned with exact measurements and statistics.

When it comes to external validity there are three factors that are particularly interesting and influential: time, place and people. The challenge is to convince people that the results of your study, which was done in a specific place, with certain types of people, and at a specific time, can be generalized to another context where some or all of these factors may be different. Because of the fast moving market, swift changes in the world of international business and ever ongoing development of new technologies, the validity of this study will be limited in time when it comes to detailed facts.

In qualitative studies reliability concerns both the technology and humans that are involved in the study. For example, it is important to describe the technologies and applications that were used for collecting data. In addition, assuring high reliability involves describing and evaluating the role and capabilities of the researcher.

2.4. Summary

- A base of **three modern theories** is used for base to this thesis research methodology; Rogers Diffusion of Innovation Theory, Moore's Chasm in the same, and finally the Hype Curve founded by Gartner Research House. All are popular theories describing the adoption and likeness to succeed for new technology.
- A **three-step approach** is set for the practical work, a pre-study to produce the Strategic Overview, empiric data collection through a workshop and final analysis of the finding, extracting a future scenario for the winning offer.
- This **study is qualitative and explorative**, making it sensitive to human bias. The author and research project is not linked to any particular industry actors, giving it higher credibility.

3. Strategic overview

*This chapter gives a strategic overview of the major factors that affects the likeliness for mobile TV services to succeed. The three areas, **end-user expectations, market requirements** and **available technologies** are analysed and the key findings presented.*

3.1. Mobile TV concepts

First of is an introduction to the concept of mobile TV and to the services that are available today, in Sweden and Internationally.

Today, as mobile communication technology have become an natural part of everyday life of millions of people all over the world, technology suppliers and service providers have to take the user and customers needs into account to stay competitive on the market. With an estimated amount of 2 billion mobile phone customers¹¹, there is an eager market to supply with TV and video content. The first step in order to develop a successful service is to know what we are dealing with. When talking about mobile TV, there are two different points-of-view to start from, TV *in* the mobile or TV *for* the mobile.

3.1.1. Converging Services

TV *in* the mobile is the easiest and perhaps most logical concept of mobile TV. It simply implies that traditional TV content is re-broadcasted towards the mobile phone. This means that the content is not produced with the mobile platform in mind, but rather just compressed and perhaps shorted versions of traditional TV content like news, sports, music videos etc. This can be considered as real-time, or a near real-time experience of streamed and programmed content over a mobile network¹². In early trails and launches this has been the clearly dominating form of service. In the US for example, the mobile TV service MobiTV streams over 25 TV channels over the cellular network¹³. The major drawback with this concept is the difference in usage behavior between traditional TV and mobile services. The content is simply not adopted and maximized to the usage situations of an outside-of-the-home, mobile viewer. The content requires long viewing times and big screens, something the mobile platform cannot provide with the limited size and battery resources, resulting in poor value and convenience for the customer.

TV *for* the mobile is an alternative point of view to the concept of mobile TV, namely that content is produced and maximized to the mobile platform and the mobile user situation. This concept involves using content that can be appreciated on the small screen of a mobile phone, is shorter in length and is utilizing the available feedback line of the cellular network.

To illustrate the differences, let us take a football game as an example of premium content with high demand in any given media. In the first concept, the football game would be offered in a smaller version of the traditional TV broadcast, hopefully cut down so that it does not demand the customer to see the whole 90 minutes but only the highlights. Still this will not offer a satisfactory service since graphics, resolution and

¹¹ Crawford, 2006

¹² Strategy Analytics, 2004

¹³ Trefzeger, 2005

the fast-moving images will have a low quality and a poor overall user experience. Translating this content into the “TV for the mobile”-concept, the game would be edited to a highlight footage, with a mix of short clips, still-image close-ups, background information and summary using a commentator, everything not longer than a couple of minutes. This content concept is supported by conclusions of many studies one usage of mobile TV, one example is the VTT report on the Finnish pilot¹⁴.

3.1.2. Examples of deployed services

In Sweden there are four major mobile network operators, Telia, Tele2, Telenor and Tre (3). They all own and run their own 3G networks and offer different forms of mobile TV or video services. Here follows a quick summary of the service offerings in the spring of 2007:

- **Telia**

Telia offer a package of TV services over their 3G network (and over EDGE in some areas). The service Telia Mobil-TV is subscription based at 69 SEK/month with no binding time and offers traditional TV channels in a mobile format. Channels are: TV4, Expressen TV, Nickelodeon, Eurosport, Eurosport 2, MTV, BBC World, Aftonbladet TV, The Voice, Star.¹⁵

- **Tele2**

Have a mobile TV service available over their 3G network with a total of 40 channels, both Swedish but mainly international channels. The price is 9 SEK per channel/month or 19-69 SEK/month for different channel packages.¹⁶

- **Telenor**

Offers free access to their channel package through their portal. The service is flat-fee for all content (not only TV services) and costs 9 SEK/24 hour.¹⁷

- **3**

The “X-series” service is a premium product from Tre offered in two forms, Silver and Gold (299 SEK/month). Mobile TV is a part of X-series called 3Show and offers the channels TV4 Nyheterna, BBC, CNBC, ExpressenTV, Fox News, Euronews, MTV, Al Jazeera and Star!. The service is available only over 3’s 3G network to 3’s consumers. Tre also offers support for Sling, a personal broadcast service, making it possible to re-broadcast your home TV, digital terrestrial or satellite, over 3G to your cell phone.¹⁸

At the point in which this thesis is written there is no commercial broadcast network for mobile TV services (although several trails have been conducted, more about these in the next part). To give a sense of how such a service could work is here some examples of international deployed services using broadcast technologies:

- **Finland** was one of the first countries in the world to trail mobile TV using DVB-H technologies. This is not so strange due to the roots and close connection to Nokia, one of the strongest promoters of the technology. The trails were conducted during March until June 2005 and involved 500 users accessing mobile TV services on a Nokia 7710 handsets. Digita, the corresponding Teracom in Finland, got the task to build one of the first

¹⁴ Södergård 2003

¹⁵ Telia 2007

¹⁶ Tele2 2007

¹⁷ Telenor 2007

¹⁸ Tre 2007

operational networks in the world and in the spring of 2007 have around 25 percent coverage in the country. This figure is supposed to rise to 40 percent by the end of 2007 but due to copyright difficulties the broadcasting is still on hold.¹⁹

- **Italy** was the first country in the world to get a DVB-H based mobile TV network up and running in a commercial service. Mediaset is the largest commercial TV broadcaster in Italy. In 2005 they bought a broadcast network license from Europa TV with the intent to use it for a DVB-H service. The goal is to reach coverage of 75 percent of the population. The broadcasting begun in June 2006 by TIM (Telecom Italia Mobile) and the network has a present 65 percent coverage of the population. TIM claims to have over half a million viewer and a nationwide network are planed for. Initially there were seven channels offered and seven more to come. Vodafone is the next mobile network operator to start using Mediasets network²⁰. The network has a capacity of 40 channels in total.²¹
- **Korea** is the most advanced market for mobile TV in the world²². The country was the first county in the world to deploy a commercial network for mobile TV, as early as 2000 for 3G based and in February 2005 for the DMB-S network, operated by TU Media(TU stands for “TV for you”), a company owned by mobile operator SK Telecom. Unlike Europe Korean operators use a combination of DMB-S and DMB-T technologies, combining the strengths of both terrestrial and satellite broadcasting. The network has a total of 500 000 subscribers, 300 000 in the satellite based alone. The satellite service offers nine TV channels and 18 radio stations, the terrestrial offer seven TV channels and 13 radio stations. The terrestrial service is owned by the government and the channels are available free of charge, either financed by the government funding or commercials. All customersare not watching from their cell phones, a market of advanced media players and portable computers are also included. The service provides 45 channels, of which 19 are TV channels to a price of 166 SEK/month²³.

¹⁹ NyTeknik.se 2007-05-08

²⁰ Sattler 2006

²¹ Lidström 2006

²² Wang 2007

²³ Lidström 2006

3.2. End-user expectations

The second part of the Strategic Overview is an analysis and summary of the two major Swedish trails, held by mobile network operator Tele2 and the infrastructure-builder Teracom, together with a brief overview of international trails.

3.2.1. Pilot studies

Over the last two years there have been numerous pilot studies and tests of different mobile TV services all over the world. Yet there have been few actual commercial launches, much due to the fact that there still are some major questions to answer and obstacles to overcome. Countries that are far ahead are South Korea and Japan in Asia as well as Italy and Finland in Europe. These countries did pilots studies at an early stage and now have commercial networks for broadcasted mobile TV available and running.

In the fall of 2006, three trails were conducted with mobile TV in Sweden. All three were located in the capital of Sweden, Stockholm, and they all used the DVB-H technology.

One of them was held by Teracom in collaboration with numerous market actors. Swedish state television and radio (SVT & SR), government owned gambling company ATG and digital broadcaster Boxer supplied the content for the trail. Nokia supplied the handsets (N92) and Teracom built and operated the DVB-H network. The trails was monitored and evaluated by MMS. The other two trails were hosted by operators Telia and Tele2/Viasat.

What do consumers want when it comes to mobile TV?

It is possible to identify a number of trends in consumer choice and preference regarding mobile TV services. Among the many observations that can be made, this analysis will focus on four major concerns:

- Usage situation (Where?)
- Time, frequency and duration of use (When?)
- Content (What?)
- Willingness to pay (How much?)

To analyse this, one may start to look at a report published in November 2006 by BMCO (Broadcast Mobile Convergence), an international, non-profit industry consortium dedicated to the advancement of mobile TV services. This document details the findings of 8 European pilot studies²⁴ in an attempt to “analyse and compare content, usage and service related results of mobile TV pilots to get a more detailed picture on relevant usage and user behaviour over time and locations”. In addition are the two Swedish studies, conducted by Tele2/Viasat and Teracom, used to support and/or challenge these findings in relation to the Swedish market.

Usage situation

The most common place to watch mobile TV is surprisingly at home. In fact has this proved to be the most common place of usage in all analyzed trails. In some cases it is

²⁴ Bmcoforum 2006

because the mobile TV offered channels that the home TV did not, or that the home TV was occupied by other family members. Interesting is also the fact that many users used the phone as a second screen for additional material or information while watching the home TV. The most anticipated usage situation is while commuting to or from work/school. The full potential of this situation has not been fully examined due to coverage issues in subways and tunnels. The same goes with the possible usage while travelling, waiting for a airplane in airports or while travelling by train. The service coverage must be fully developed to give an accurate view of these additional situations.

Time, frequency and duration of use

One of the biggest expectations from the TV industry is that mobile TV will expand the TV usage over the whole day compared to the traditional TV that has peak viewing hours from 6 pm to 10 pm. Trails do show that view is generally spread pretty much evenly throughout the day. Overall, users also watch for a fair share of time, both per session as well as per day and per week. Each viewing session is rather short, due to the usage situations during breaks, on the move or while waiting.

Content

News and live broadcast has showed to be the by far most popular content during trails. Mostly live broadcast has involved premium content like live football games and special events, which is content with a high attraction value by customers. Other examples are different types of short clips, like user-generated content similar to You Tube is also popular, as is trailers for high profile movies. Viewers prefer strong brands that are already built up by regular TV.

Willingness to pay

The two major alternatives for customers to pay for mobile TV is either flat-fee subscriptions of either specific channels or channel packages. Most popular among trails user is the free-air content, financed with discreet commercials.

Even though there are competitors, mobile TV seems to have a place in consumers' media consumption. People watch in different places, at different times, and they do enjoy the content and quality that has been offered in pilot studies. The places where people watch mobile TV expands the well known ritual of watching TV. It also expands the notion of primetime since people easily can watch at other times. Even though people mostly watch what you think they would (such as news and sports), they also watch movies and documentaries. A package of about 15 channels, similar to Swedish cable TV offerings, is preferred by many consumers. Overcoming technological difficulties such as poor battery life and large handsets is crucial in order for users to adopt the service. Consumers are used to finding a number of features on their current handsets; they are not prepared to give up on these just in order to have mobile TV. Combined with a stable network the offer as it stands today is appealing to consumers. If priced at the correct level, at around 50 SEK, mobile TV might just be a hit²⁵.

3.2.1.1. Pilot studies conclusion

Another summary of user preferences has been made by C-mobile (2006). In the table below are the key end-user expectations extracted from five analyses of early trails and pilot projects from all over the world.

²⁵ BMCO forum 2006

Steel ¹	Horn ²	Mittermayr ³	Vanjoki ⁴	Van den Dam ⁵
Easy channel-switching Time shifting "Back to Start" Feature (Interaction) (Program sharing) Additional information	Type of content (small screen, shorter viewing times) Quality of service and usability (service availability, audiovisual quality, zapping delays) Added-value for mobile users ("always connected", program guide, personal VCR) Business model (Time-to-market, service offering, additional revenues)	Large coverage (deep indoor, on the go, outdoor ...) Interactivity Unlimited number of channels Easy use Support for unlimited number of TV viewers	Convenience Ubiquity Reachability Security Customization Localization Spontaneity	Availability Program content (complement, not replace traditional TV) Pricing Easy-to-use devices Content Pricing User friendliness Business model DRM Technology standards and spectrum allocation

Table 1: Conclusions of pilot studies

References:

- [1] Steel, Dirk, "Evolution in Mobile TV: Mobile TV Broadcast / DVB-H", Jahr.
- [2] Horn, Uwe, "Mobile TV Overview", Ericsson Confidential, 2005.
- [3] Mittermayr, Herbert, "Focusing on the User: How Unlimited Mobile TV is broadening end-user's life", 2005.
- [4] Vanjoki, Anssi, Report on Milia / MIPTV & London, 2005.
- [5] Van den Dam, Rob, "TV on a mobile: Extending the entertainment concept by bringing together the best of both worlds", 2006.

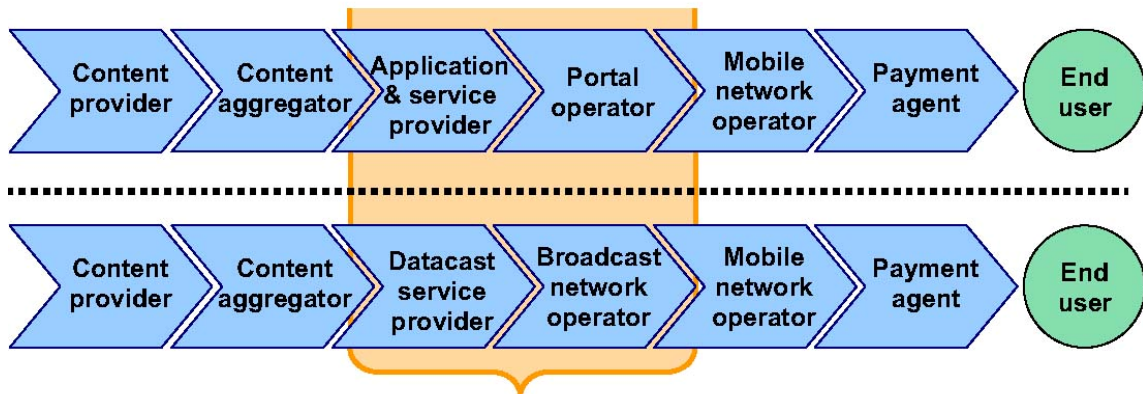
3.3. Market requirements

This chapter gives an introduction the Swedish market with size and potential. The actor network with key players is introduced with a description of the connections and collaboration between the players.

3.3.1. The mobile TV value chain

To be able to provide a feasible service offer, it is also important to analyze the market in order to obtain structure and requirements of the actors involved. In the mobile service value chain, the mobile network operator have had a dominant position as the key actor, both owning and controlling the infrastructure and also holding the payment and billing support against the customer. In the specific application of mobile TV the role is slightly shifted and the mobile network operators need to build new bounds and collaborations with new actors like TV-channels and other traditional media companies. To understand the market requirements, let us first take a closer look at the mobile TV value chain and the different actors involved.

① Value chain for mobile TV over cellular networks



differences between both value chains

② Value chain for mobile TV over broadcasting networks

Figure 5: The mobile TV value chain for streaming and broadcasting services, highlighting the differences.²⁶

- **Content owner:** Owns the rights to sell and distribute specific content, often in close collaboration with or same actor as content providers.
- **Content provider:** Offers original content or popular brands for the service. Well-known brands, format and content help to add attractiveness to new services like mobile TV, pushing user acceptance. The trademarks serve as assurance for high-quality content; hence content providers have an important position in the value chain with a strong bargaining position.
- **Content aggregator:** Selects and packages content from different sources into a convenient and attractive bundles. These bundles can be sold to service providers or directly to customers. In the case of the later, content aggregators need to collaborate with a payment agent to be able to bill customers for the

²⁶ Trefzger 2005

services. This part is often filled by traditional media companies with long experience and well-established brands.

- **Service provider:** Develops implements and operates mobile TV platforms, only available in services based on cellular networks. This actor builds applications around the content, often in close collaboration or partly operated by content providers.
- **Portal Operator:** Player only available in the cellular based value chain that offers mobile TV content and services on its portal. Portals can be run by mobile network operators or third party portals, the first only available to the operator's customers and the later need to establish billing relationships with each network operator to access their customers.
- **Datacast Service Provider (IPDC):** Is a player only in the broadcast value chain. Sells network capacity in the broadcast infrastructure to content providers and aggregators. Can also offer other services like content protection (DRM) or billing.
- **Broadcast Network Operator:** Owns the broadcast infrastructure including transmitters, masts and all necessary connections. Is in close collaboration with several datacast service providers that sell capacity and coverage for them. This player owns the frequency license, if one is needed. This role could be filled by a traditional TV broadcaster, completely removing the mobile network operators from the mobile TV value chain. Therefore MNO's are extremely eager to be a part of the building, owning and running of a broadcast network operator business.
- **Mobile Network Operator:** Owns and operates the cellular networks and holds the necessary frequency licenses. In the broadcast value chain this actor is only important to provide a feedback line from the customer. Have a close relationship with the customers and makes it possible and easy to charge customers for services.
- **Payment Agent:** is needed to bill customers for used services, unless the mobile TV content is offered free and financed through advertisement. This part can be played by either a bank, credit card company or the mobile network operator. In order to have high user acceptance, the payment for service must function smoothly and not require too much effort for the customer.

By 2015, mobile television in Europe could be a €24 billion market and reach more than 190 million users²⁷. This makes it a great opportunity for broadcasters, mobile operators and handset manufacturers to find new revenues from existing content. There are however some obstacles to overcome in order to reach this new market. First of all the actors need to cooperate more than they do now. Successful collaboration depends on establishing economic models that will reward all participants while leaving them to focus on their core capabilities.

The total market for mobile TV in Sweden is estimated to approximately nine million subscriptions²⁸, based on data on number of subscriptions of mobile telephony in Sweden from PTS 2005 ("Post- och Telestyrelsen"). This figure needs to take into account the 90% coverage possible for a new network to reach Swedish households,

²⁷ Bughin 2006

²⁸ Netlight 2006

making the final projected market around 8 million subscribers, with both private and business users included.

Furthermore is the total turnover estimated to around 900 MSEK, based on an approximation from number of subscribers and willingness to pay (783 MSEK), extracted from pilot studies and projected revenue from advertisement (92 MSEK each year).

It is possible that customers want to watch the same programs on their mobile phones as they do on their TV at home, the same pre-packaged and well-branded TV channels. Content is and will probably always be king forcing mobile TV channels to mix easy-to-use push and on-demand programs²⁹. Pilot studies show that free-to-air content is much appreciated, making public service and advertisement financed content a key requisite for a successful mobile TV launch, regardless of underlying technology.

The last and important issue is that customers are showing a limited interest in paying high amounts (on average €6 per month) for mobile TV services. This puts pressure on manufacturers to develop more modestly priced mobile TV-ready handsets. The same goes with mobile operators and broadcasters, costs need to be cut and service offers priced at an attractive level towards the customers.

3.3.2. The Swedish mobile TV market and actor network

This thesis will focus on the Swedish market, its actors and the opportunities available on the future mobile TV market. The current market for TV and mobile telephony will be introduced, since it is probable that the new market will spawn in the intersection of these two markets.

The Swedish media industry has undergone major changes since the end of the 1980's. Deregulation and technical innovations have massively increased the number of media channels. The number of TV channels has increased from two in 1987 to more than forty with Swedish speech or text in nineteen years. However have the average media consumption not increased in the same rapid rate, since 1979 has the average time increased 30 minutes, of which 21 minutes is for Internet usage³⁰.

Sweden is with an international perspective a small market with a total of **9 127 058** inhabitants, of which **1 925 924** are located in the Stockholm region in March 2007³¹.

Media form	Percentage (2005)
Subscription to a newspaper	74
Radio	97
TV-set	97
-only one	30
-two	36
-three or more	32
Text TV	92
Multi-channel TV (more than free-air)	74
-via cable	35

²⁹ Capgemini 2006

³⁰ Nordicom 2004

³¹ SCB

-via satellite	23
-via terrestrial broadcast	18
Digital TV	45
Video	84
DVD player	67
Home computer	83
-with Internet access	74
Laptop	30
PDA	7
MP3-player	30
Mobile phone	93 ³²

Table 2: Media availability and usage of different forms of media in homes for the Swedish population ages 9-79 in 2005.

Media form	Usage (in minutes)
TV	96
News paper	29
Radio	105
Internet	32
Magazine	14
Book	21
CD record	20
Text TV	3
Video/DVD	12
MP3	7
Cassette track	2
In total:	341 minutes

Table 3: Average usage of media forms for the whole population (9-79 years) an average day in 2005

TV

In Sweden there are approximately 4 million households with access to TV-recievers³³. These receive TV content over terrestrial, cable and satellite transmission. The different technologies break down as follows:

Distribution form	Dominating actors	Market shares, number of subscribers in 2005
Terrestrial: ~30%	Teracom (analogue)	Free-air

³² Nordicom Sverige

³³ Radio- och TV-verket 2006

	Boxer (digital TV)	531 000
Cable: ~50%	Com Hem	1 429 000
	UPC (bought by Com Hem)	299 000
	Canal Digital KabelTV	222 000
	Tele2Vision	182 000
Satellite: ~20%	Canal Digital	906 000
	Viasat	761 000

Table 4: The major actors on the Swedish TV market

When talking about Swedish TV channels the top ten can be categorized³⁴ as “The Big five”: SVT1, SVT2, TV3, TV4, Kanal5 and “The small five”: ZTV(TV6), MTV, Discovery, Eurosport, TV4+.

Mobile Telephony

The mobile industry can be divided into the following categories: infrastructure manufacturers, handset manufacturers and operators. There are also regulating actors like PTS (Post- och Telestyrelsen) in Sweden who are dividing the available spectrum and controlling the operators business. There are also standardization organizations with the purpose to develop business standards for new technology.

Examples of whole sale providers are Ericsson, Nokia, Motorola, Alcatel and Siemens, that are providing all the necessary components and services to build and run a mobile network, including terminals³⁵. Handset manufactures are for example SonyEricsson, Samsung and LG. The operators traditionally manage the operation of the mobile networks and also the development and sales of new services and in general own their networks.

Sweden has come a long way in the mobile area with a total of 90 percent of the population regularly using a mobile phone³⁶. In 2005, the market for mobile telecommunication services saw revenue of SEK 16,613 billion. As of 31 December 2005 the total number of subscriptions was 9.1 million. There are four mobile network operators (the four T's) that are close to complete market domination; Telia, Tele2, Telenor and Tre.

Operator	Year of launch	Technology	Market share (subscribers)
TeliaSonera	1992(GSM)	NMT, GSM 900/1800, UMTS	43 %
Tele2	1992	GSM 900/1800, UMTS	35 %
Telenor/Vodafone	2003/1992	GSM 900/1800, UMTS	17 %
Hi3G (3)	2003	UMTS	3 % ³⁷

Table 5: Mobile network operators on the Swedish market

³⁴ MMS 2006

³⁵ Heickerö 2003

³⁶ SIKA Institute 2004

³⁷ PTS 2006

3.4. Available technologies

This chapter presents the technical alternatives to distribute mobile TV. First is an overview of the two major concepts, streaming and broadcasting and some words about the regional differences that exists between different technologies. In the end is a overview of the spectrum issues that probably is one of the major hurdle for any new wireless technology.

3.4.1. Characteristics of Mobile TV & Video

To enable mobile multimedia services in a handheld device there are mainly two ways:

- Video streaming and downloading of *unicast* services (to one subscriber) or *multicast* services (to many subscribers simultaneously), mainly within 3G cellular networks.
- Broadcasting multimedia content over a separate to many subscribers over a large area.³⁸

There are numerous technological standards available today and they are often slightly different depending on where in the world they operate. Different regions have different standards and actors, mostly when it comes to standards for broadcasting, here are some examples:

- DAB-IP in UK
- DVB-H in Europe and USA
- T-DMB in Korea
- ISDB-T in Japan
- FLO in USA
- TDtv in UK

3.4.2. Streaming over mobile networks

The advantage of using the 3G networks is that these already have allocated spectrum, are planned and in great extent already built with a good coverage. Add to this that the necessary billing and authorization system are also in place. By using Multimedia Broadcast Multicast Service (MBMS) it is possible to offer broadcast-like services using a 3G network.

3.4.2.1. Unicast

GSM (2G): The first and actually most evolutional development in mobile phone technology was the introduction of simple data services in 2G (GSM) networks using GPRS. It is regarded as a subsystem to the GSM standard and provides a packet-switched data communication with a bandwidth of up to 115 Kbit/s³⁹. GPRS later evolved into the EDGE technology (called 2.5G), which further enhanced data rates. EDGE can offer connections up to 384 Kbit/s.

UMTS (3G): The next step in the mobile communication development was the third generation (3G) UMTS networks. In Sweden, like most European countries there are today fully operational 3G networks and they are steadily increasing their market share towards the older GSM networks. The system was designed to support multimedia

³⁸ Crawford 2006

³⁹ Trefzger 2005

content like video streams and hold data rates up to 384 Kbit/s. There is however limitations in the number of simultaneous streams in each network cell, meaning that as the number of users in one limited area, a city centre for example, the data rates drops drastically. The bandwidth also depends on how close the user is to a base station, leading to that user close to sender base stations get almost all the bandwidth and other users, further away hardly any bandwidth at all.⁴⁰ The 3G networks were also designed for one-to-one communication, like the not so successful video call service. Video and TV-like services make an inefficient use of the network bandwidth and it is even possible that to many simultaneous users of a mobile TV service over the 3G network, for example a world cup final in football, could very likely take down the whole network.

Cellular networks are and will continue to evolve, providing more and more bandwidth. The latest UMTS enhancement is HSPA, providing dramatically increased peak data rates with possible down links of up to 14 Mbit/s. In Sweden upgrades to this technology is deployed as this report is written. The higher data rates make it possible to support a low or moderate use of mobile TV services but as the number of users is increasing the networks will be overloaded and sooner or later reach a level where it is no longer possible to assure basic service levels.

3.4.2.2. Multicasting – MBMS

This is where Multimedia Broadcast and Multicast Service comes in use to provide one-to-many distribution of video content. The technology is an extension of GSM and UMTS networks and is standardized by 3GPP. The idea is that unlike unicast services, where the capacity is limited by the number of simultaneous users, MBMS is limited by the number of content channels. This enables great resource savings in the network and together with the moderate changes in existing radio and core network it requires, it is a very competitive alternative to broadcast technologies. From a customer point-of-view it is also an attractive alternative since it does not require new mobile phones with separate antennas.

3.4.3. Dedicated broadcast networks

DVB-H (Digital Video Broadcast Handheld) is a development of the DVB family, where DVB-T is at present the dominating form of distribution for digital TV to homes in Europe. It became an ETSI standard in November 2004, making it a competitive alternative for mobile TV broadcasting in Europe. The basic features and advantages is that it combines traditional broadcasting standards with mobile device specific features. In the DVB-H standard two major limitations of the DVB-T technology was tackled, extending the battery life time and improving the robustness of the challenging receiver environment of using a built-in antenna⁴¹. By using time-slicing, sending data in bursts at high data rates rather than constant streams, it is possible to increase the battery life time. Between the bursts, the receiver is idle and no data is received. The technique saves up to 90% of energy compared to DVB-T.

⁴⁰ Trefzger 2005

⁴¹ Friström 2006

Technology / Criteria	Broadcast networks	Satellite	Cellular networks			
			Unicast			Multicast
			DVB-H	S-DMB	GPRS (2.5G)	UMTS (3G)
Broadcast possible	yes	yes	no	no	no	yes
Number of channels at 128 kbit/s	60	18				13
Max. data rate (per connection)	~ 11 Mbit/s whole network	2 Mbit/s per beam	115 kbit/s	384 kbit/s	14 Mbit/s	128 kbit/s
Typical & realistic data rate	~ 11 Mbit/s whole network	2 Mbit/s per beam	30 kbit/s	30 - 300 kbit/s	550 kbit/s - 1100 kbit/s	128 kbit/s
Common data rate for video stream	128 - 384 kbit/s	128 kbit/s	30 kbit/s	72 - 128 kbit/s	128 - 384 kbit/s	128 kbit/s
Quality of video	very high	high	medium	medium - high	very high	high
Mass market availability	2008	2008	already available	already available	2006	2007
Investment costs (CAPEX)	high	medium	low	low	low	low
Efficiency of mobile TV delivery	high	high	low	low	low	medium

Figure 6: Overview of the capacity of available technologies. The low, medium or high scale is only applicable in relation to the other alternatives in this specific graph.

DVB-H also uses a return path over the existing cellular network, making user interaction possible.

There are however some limitations to DVB-H. It requires a rather high density of transmitters, similar to the cellular network, to provide an acceptable indoor coverage in urban areas⁴². It also requires handsets specially equipped with DVB-H antennas and spectrum needs to be allocated for the new network. On the other hand it provides a high bandwidth of up to 11 Mbit/s, allowing simultaneous transmission of 25-80 mobile TV channels, depending on desired quality.

There are other ways of broadcasting TV content to mobile phones. One is using satellites, effectively covering a large area with a high capacity⁴³. Supported standards are S-DMB and DVB-S. Using satellites it is possible create hybrid terrestrial/satellite services to cover gaps in the terrestrial transmission. An S-DMB service give good indoor coverage in urban areas and can provide up to 18 channels of good quality mobile TV channels at 128 Kbit/s. This is a good way to provide push-and-store services where content is downloaded when reception is good and stored locally at a memory card in the mobile phone. ⁴⁴

⁴² Nokia 2004

⁴³ Alcatel 2005

⁴⁴ Trefzger 2005

3.4.4. Spectrum regulation

The most important factor in the development and commercialization of all these platforms is the availability of harmonized spectrum at a reasonable position in the band to create adequate, market sizes to be covered by handsets with reasonable form factors and efficiency⁴⁵.

The current Analog switch-over (ASO) in European TV broadcasting technologies frees up spectrum that possibly could be used for mobile TV services. The old analogue technologies required a lot more spectrum than now is free thanks to more effective, digital broadcast methods. Since this ASO is happening more or less all over the world there is a great opportunity to harmonize and structure the allocation of the free spectrum bands, in order to for example create a European mobile TV spectrum.

Spectrum can be divided into three categories:

- VHF – Band III: This band has exceptionally good propagation and Doppler and building penetration characteristics. However does the wavelength in the VHF band imply large receiving antennas, which is difficult to include in small mobile phones. This spectrum can therefore only be used for larger receiving units, built in cars etc.
- UHF – Band IV & V: Have a reasonable propagation and building penetration and good coverage. It is possible to make handsets with a small antenna, suitable for integration. On the other hand the IV & V band heavily congested by TV broadcasters that are simultaneously sending analogue and digital signals in the ASO-process. In some parts of Europe it could take as long as 2010-2020 when this spectrum is free and available.
- L-Band and above: this band uses a very high frequency, leading to greater propagation losses.

In Europe there has been voices raised to more or less force member states to allocate spectrum for a DVB-H network, in order to get the mobile TV business rolling⁴⁶. Representatives from companies supporting MBMS solutions, like Ericsson, dislike the idea since this would give other technologies a favorable situation.

In the appendices there is a table that gives an overview of the different broadcast technologies and their spectrum requirements. DAB and DMB have a clear advantage as they can fit into existing frequency plans at 1.7 Mhz slots already allocated for Digital Radio Broadcasting in VHF and L-Band. In Sweden, where DAB has not reached a great popularity, this spectrum could be easily accessible. S-DMB is also operating at 1.7 MHz, using existing allocations. DVB-H, ISDB-T, and FLO are optimized for use in the UHF bands.

⁴⁵ Crawford 2006

⁴⁶ Reding 2007

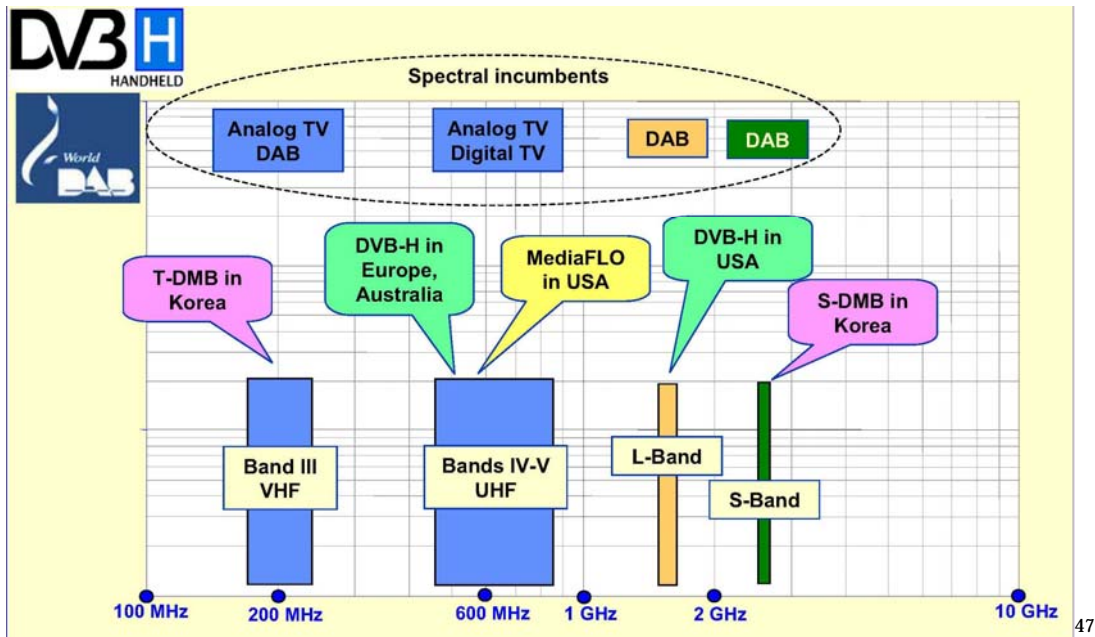


Figure 7: Illustration of spectrum and actors for different technologies. Note the incumbents, competing with mobile TV for the available spectrum.

3.5. Summary

- Mobile TV can be defined as TV *for* the mobile or TV *in* the mobile. The later is most widely spread in early service launches but the real potential is in the first. If content providers started to create content *for* the mobile, it would utilizes the strengths and weaknesses of the mobile phone and creates potentially immensely popular services.
- Essentially users expect high-quality content from well-known brands from the established TV industry. The service need to be available whenever and wherever the user is and the quality of image and audio needs to be sufficient.
- Actors from both the TV and the telecom industry are very interested in the development of mobile TV services. The development will create some changes and shifts in the value chain, making content providers more important and strategic alliances with them is useful, if not essential for both mobile network operators as TV broadcasters.
- The two major concepts of delivering mobile TV is either by re-using the mobile networks (MBMS/HSDPA) or building entirely new networks dedicated to mobile TV (DVB-H). By re-using already functional networks, mobile TV services could be launched within a short period of time. The later alternative gives higher quality then but costs a lot to deploy and requires dedicated spectrum.
- Spectrum is crucial to any new wireless communication technology and is there for hard currency on the international market. Mobile TV actors supporting broadcast services needs to convince the politicians that mobile TV is more important and gives the society higher value then mobile broadband or HDTV.

⁴⁷ Howson 2005

4. Empiric results

This chapter summarizes and presents the overall approach for preparations, realization and the results in the workshop that where conducted on the 30 November 2006.

4.1. Workshop

One of the major sources of empiric data in this study was the workshop held in the end of November 2006. This was the first in a series of three for the whole research project (“A Tele-economic Study of Mobile TV”). For this thesis however there is only room to cover the first one.

4.1.1. Preparations

The overall approach was to invite representatives from the whole actor network from the Swedish telecom- and media market, as high up in the company hierarchy as possible. The idea was to create a broad mix of people with different backgrounds and knowledge to achieve a complete picture as possible of the current situation on Swedish the mobile TV market. To find the actual representatives to invite, a small market research was conducted by reading articles, attending seminars and search the Internet for people somehow involved in mobile TV activities. A list of these people was produced and every person on the list received an invitation to the workshop by e-mail. The invitation was later followed up by a phone call to confirm if the person was willing to attend the workshop. About two weeks prior to the workshop, a compilation of introductory material was sent to the participants. This was more or less a short version of the Strategic Overview included in this thesis and contained a short introduction and summary of important issues around the four major themes of the workshop:

- Consumer behaviour
- Content
- Technologies
- Business models

The idea was to give the participants a common base of knowledge and updates of current events to facilitate the discussions during the workshop. Everyone should at least have a common “lowest” level of understanding of the subjects. In this document was also some practical details and information included about the actual workshop session.

4.1.2. Participants and realization

The workshop, or workshops, was held on Thursday 30 November 2006, at Focus Inn I Stockholm. Focus Inn is a company supplying specially designed rooms and services for workshops and focus groups. The rooms were equipped with video cameras, microphones and see-through glass for observing and recording of the discussions. Coffee and beverages was supplied at all times and was all in all a very comfortable and for the purpose perfect environment.

The workshop was held three times throughout the day, two in parallel during the morning and one in the afternoon and each theme were covered during a 5 minutes discussion for each group. Here follows a list of the participants in the three groups:

Group 1, morning session

Pontus Bergendahl, CEO, MMS

Mark Jefford-Baker, Customer Analyst, Ericsson Multimedia

Tomas Hedqvist, Analyst/consultant, Xlent Strategy

Peter Holmström, Director Mobile TV, Strix

Peter Siljerud, Analyst, Kairos Future

Maria Wiss, Business Developer, Kanal 5

John Guthed, Project Manager, 12snap Lokomobil

Group 2, morning session

Per Holmqvist, CEO, Mobiento

Aurelian Bria, Researcher, Wireless@KTH

Weje Sandén, Editor-in-chief, Veckans Affärer

Anette Bohman, Director Mobile Services, TV 4

Mattias Wiklund, Analyst Market Affairs, Post- och Telestyrelsen

Jonas Hagblom, Technical Handler, Radio- och TV-verket

Group 3, afternoon session

Patrik Höljö, Business Director Content Services, Telia

Björn Johansson, Analyst, SVTi

Carl-Axel Gustavsson, Media advisor, Kulturdepartementet

Henrik Pålsson, Director Consumer Lab, Ericsson

Johan Wahlberg, Strategy Advisor, SVTi

Jens Häger, Consultant, Mediavision

Pär Sundberg, CEO, OTW

Anders Willmes, System Developer, Interactive TV Arena

For every workshop session there was a moderator, picked out among the research team to host and facilitate the discussion. The moderator was using a script with key questions and guidelines as support during the discussions, this script can be found in the appendix (in Swedish). During the sessions the rest of the group was following the events behind the glass walls, taking notes and documenting interesting quotes or ideas.

The discussions were analyzed, summarized and documented and a final summary of thoughts and ideas spawned from the discussions were sent to the participants for comments and a base for the following two workshops held in the spring of 2007.

4.1.3. Results

All conversations and discussions during the workshop session were recorded and saved in DVD-format. It was later transcribed and analysed by the research team. The workshop resulted in over nine hours of high-quality discussions with key representatives and decision makers from the Swedish telecom- and media industry. Here follows a short summary of the results from the workshop, extracted from the discussions, categorized into the initial four categories:

Consumer behaviour

- The mobile is personal and we have it with us 24/7.
- The consumers must control the development of future services, although this can be hard when they do not know what they want.
- Free newspapers are one of the major competitors of the consumer's attention in the most common use case (while commuting, according to pilot studies). They are easy to get stated with and do not require our full attention.
- A new mobile TV service needs to extend the established behaviour of traditional TV and keep the "rituals" connected to it.
- The product or service must be something the customer understands and appreciates to get them to pay for it.

Content

- Large and well-known brands are very important, it guarantees high quality.
- Live content is strong, as is news. Content should be new and fresh.
- Needs to support and encourage spontaneous viewing.
- Trailers and exclusive content could be popular if connected to established brands in other media.
- Multi-channel production is not difficult or expensive to host as long as it is planned for in advance.
- Different services could be combined to keep the customers attention longer, for example could on listen to a football game as radio and watch the goals over TV.
- Content rights and intellectual properties are a big issues still to be resolved, is the rights for mobile TV included in the contract for traditional TV?

Technology

- Most technologies are at present well developed and fully capable of hosting mobile TV services. The question is rather who will make the heavy initial investments and thereby control the infrastructure.
- Traditional TV content in the mobile is not the optimum utilization of the mobile format.
- Each person should have access to three screens, one small in the pocket, one mid-sized in the bag and one big in the home.

- The spectrum issue is critical since, who will get access to the possibly free spectrum after the analogue switchover?
- 3G does not give a satisfying image quality with the present standard, will get better with future upgrades of the 3G network (HSDPA).
- There is probably room for parallel technologies, both broadcast and streaming alternatives. The challenge is to create common interfaces for the customersto interact with both types of services.
- Concepts like “Internet in the air” could act as guidelines for the future.

Business models

- The big content providers and owners will have an important and powerful role in the value-chain.
- There is a strong trinity in the operators, terminal manufacturers and content providers, where operators have a key role in linking everything together.
- Payment models needs to be crystal-clear towards customers.
- On-demand services attract the young users more and broadcast are favoured more by the older, both groups are important to create a profitable market.
- Free is good, can be financed through commercials. Premium packages paid by subscription will not give the same pick-up rate.
- Advertising in mobile phones have proved to be successful, it is however unclear how much advertising consumers can take before switching channels. The “sponsor” approach is commonly accepted with commercials before a clip or broadcast.
- In the short term, before the standards and infrastructures are set and built, the actor network will stay more or less unchanged. However, as the market gets more mature, new actors could find their way into the actor network and compete with the established ones.
- Critical to the success of mobile TV services are the quality in the collaboration between actors, everyone needs to work together to ensure that the product or service is considered valuable from a consumer perspective.

4.2. Analysis

This part concludes one; the findings from the three earlier focus areas from the Strategic Overview (user expectations, market requirements and technology) and two; the workshop results and summarizes them in a complete list of parameters for a successful service is presented.

4.2.1. Key end-user expectations

- *Easy channel switching* – users expect that zapping is as easy and quick as using a traditional TV at home.
- *Quality of the service* – the quality of audio and video needs to be at an acceptable level, audio in particular, since quality disruptions in audio are more annoying than image quality issues.
- *Coverage (indoors)* – the service needs to be accessible from any location supporting the mobility of the user.
- *Content bouquet* – the user expects a broad selection of content since the usage situations is different from normal TV. The user switches channel quicker and more often, the total viewing time is shorter and content needs to be dynamic, complex and interactive.

Analysis & comments:

The results from the pre-study (Strategic overview) correlates well to the results from the workshop. The clearest factor is the need for high usability and availability and the customers demand for familiar content from established TV brands.

4.2.2. Key market requirements

- *Charging the user* – in the case of cellular or broadcast services, it must be possible to bill the customer for the service. This is not necessary with a advertisement financed service.
- *Service Access Control* - Management of subscriber access to services depending on account, preference and also including age verification.
- *Content protection* – It must be possible to protect content from being copied (DRM), especially important in the cellular based services where license agreements on content is harder to get than in a broadcast service, where licenses for content distribution in traditional TV includes mobile broadcasting.
- *Reporting* – Possibility to track usage behavior and advertisement.
- *Investments* – How much does a new network infrastructure cost? The additional investments, which are required to set-up a national network based on the technology.
- *Frequency availability* – There has to be appropriate spectrum available in order to deploy a new broadcast network, how well does the spectrum scale in a European perspective? In some countries it is literally impossible.

Analysis & comments:

When it comes to market requirements there are some differences from the pre-study to the workshop results. For example is the question of who is going to build or supply

and later control a mobile TV network infrastructure hotter in Sweden than other countries. This has probably to do with the fact that Sweden is somewhat behind other countries when it comes to trials and deployment of broadcast networks. Mobile network operators are the most keen to drive the development since they have much to gain in increasing the use of the networks but the raising actor in the value chain are the content providers, who will have a stronger position in the future. All actors need to start developing strategic relationships, linking together a complete actor network to be able to supply killer services.

4.2.3. Key technology factors

- *Feedback channel* - Some technologies provide a generic feedback channel to allow interactive services or transaction services.
- *Secure delivery* - The possibilities of the transmission technology to assure the delivery of contents. This might have a great impact on the payment options.
- *DRM support* - Support of DRM systems.
- *Energy consumption* - The energy consumption of the mobile device compared to a voice centric mobile device.
- *System complexity* - The complexity of the complete system and involved entities. The more components are involved the higher is the possible failure rate.
- *Transmission quality* - The quality of transmission at a typical usage scenario, e.g. in the car, train or while waiting at a bus stop needs to be sufficient.

Analysis & comments:

With the close connection to Ericsson, actors on the Swedish market have a clear respect and loyalty towards Ericsson. Since MBMS, the Ericsson-developed competing technology to DVB-H, has not really been fully developed yet there is a sense of wait-and-see among actors. Even the regulatory functions on a government level seems to support the idea of re-using the cellular networks for mobile TV, rather than investing and building new dedicated networks. As far as the technology is concerned, the overall belief is that technology is not the major issue to solve, there are competitive and functional alternatives unavailable today. The two major issues that still need attention are the battery life of multimedia phones and the possibility to “hide” additional antennas inside the phone, avoiding the need for clumsy and ugly external antennas that mobile phones had in the early nineties.

4.3. Summary

- The workshop conducted during the studies involved over 20 representatives from the Swedish telecom- and media industry, with key actors and decision makers from the most dominant companies. The purpose was to test and extract key parameters that affected the development and future success in uptake among customers.
- Results show on a maturity and insight among actors on the Swedish market. Although Sweden is somewhat behind in the development, compared to other European countries like Finland and Italy, where there is as good sense of what needs to be done and a confidence that it could be done.
- In short are the concluding success factors that mobile TV services need to be adapted to the mobile format, offer high-quality in both content (brands) and overall experience. The most preferred payment model is flat fee or free-air channels financed with discreet and customized advertising. From a consumer point-of-view there is no great difference in experience between 3G based services (with HSDPA/MBMS upgrades) or dedicated broadcast networks. Therefore is the most feasible solution to reuse existing infrastructure and focus on the content and design of the mobile TV service, rather than the distribution.

5. Results

This last chapter concludes the study and aims to give a suggestion to what is ahead of us in the future, beyond the hype around mobile TV. Firstly is a conclusion of the findings with a starting point in the initial research questions.

5.1. Definition of mobile TV

Mobile TV can be defines as TV *for* the mobile or TV *in* the mobile. The later is most widely spread in early service launches but the real potential is in the first. If content providers started to create content *for* the mobile, it would utilizes the strengths and weaknesses of the mobile phone and creates potentially immensely popular services.

To illustrate the broad sense of how the concept of mobile TV should be considered, here is the view of Broadcast Mobile Convergence:

“Mobile TV is an audio-visual service which may provide two way multimedia communications to mobile handheld devices with broadcast downlinks and return links in frequency bands dedicated to telecommunications services.”-BMCO

The concept should therefore not be limited by the traditional, linear concept of TV in our homes. A successful mobile TV service offers that together with on-demand video, still images, sound and text.

5.2. Characteristics of successful service design

- Mobile TV services need to be adapted to the mobile format, offer high-quality in both content (brands) and overall experience.
- The most preferred payment model is flat fee or free-air channels financed with discreet and customized advertising.
- From a consumer point-of-view there is no great difference in experience between 3G based services (with HSDPA/MBMS upgrades) or dedicated broadcast networks. Therefore is the most feasible solution to reuse existing infrastructure and focus on the content and design of the mobile TV service, rather than the distribution.
- Industry actors need to find strategic alliances with other actors to form a seamless chain from the content provider to the end customer.

5.3. Pros and cons of available solutions

Cellular	3G MBMS TDtv	Pros	Cons
		<ul style="list-style-type: none"> -Incremental investment -Universal spectrum available -Handset feature add-on -Simple value chain -Supports mobility -Better coverage 	<ul style="list-style-type: none"> -Limited capacity -Less cost efficient -Not yet fully developed
Broadcast	DVB-H S-DMB T-DMB DAB-IP	Pros	Cons
		<ul style="list-style-type: none"> - Good broadcast performance - Higher capacity = more channels 	<ul style="list-style-type: none"> -Costly investment -Competing standards -Unclear handset availability -No unified spectrum -Complicated value chain

Table 6: Pros and cons of available technologies

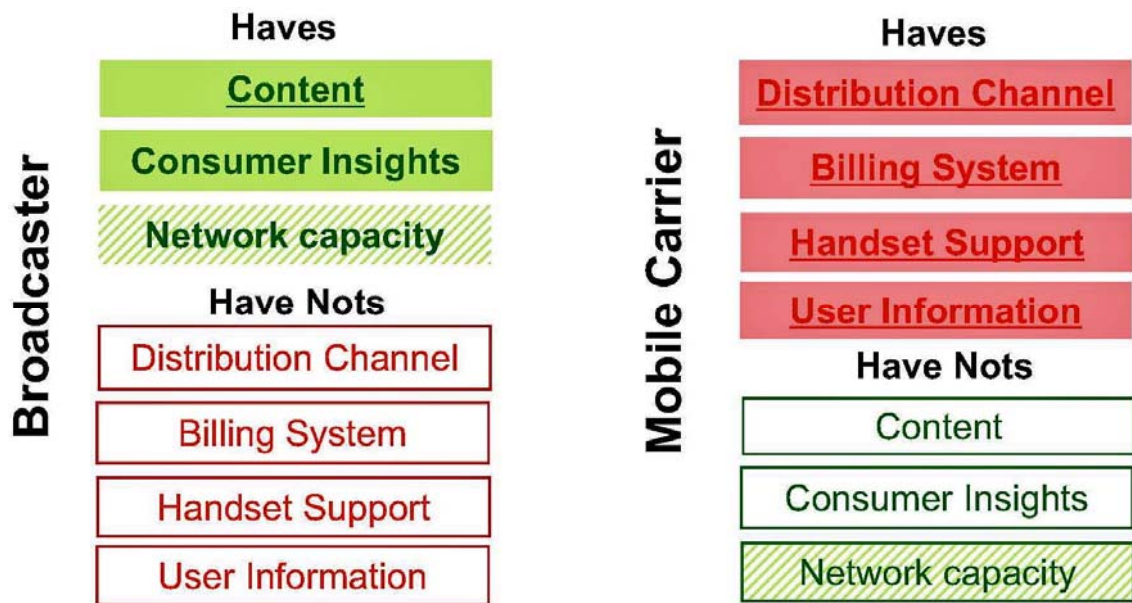
Comments:

This matrix gives a fair overview of the two major concepts, streaming over cellular networks and broadcast. When it comes to different broadcast technologies, this is more a question of regional policies and connection to technology supplier. The different standards are more or less similar in capacity and characteristics but in Europe the DVB-H standard seems to be most preferred.

The initial objective was to perform a deeper analysis of the different technical alternatives but this proved to be somewhat pointless since the main issues involving development of mobile TV services does not relate to what technological standard or approach you choose. Overall is the technology mature and ready to launch if actors can decide on standards and play by common rules.

5.4. Strategic recommendations

Given the prior assessment of success factors, there are two possible scenarios for the Swedish market. The first is a mobile operator centric where the development of mobile TV takes the route of utilizing the existing 3G mobile networks and MNO's implementing MBMS. The other is one where TV operators and traditional media get licenses, take control over the content and build their own mobile TV broadcast network, leaving the MNO's more or less outside the loop.



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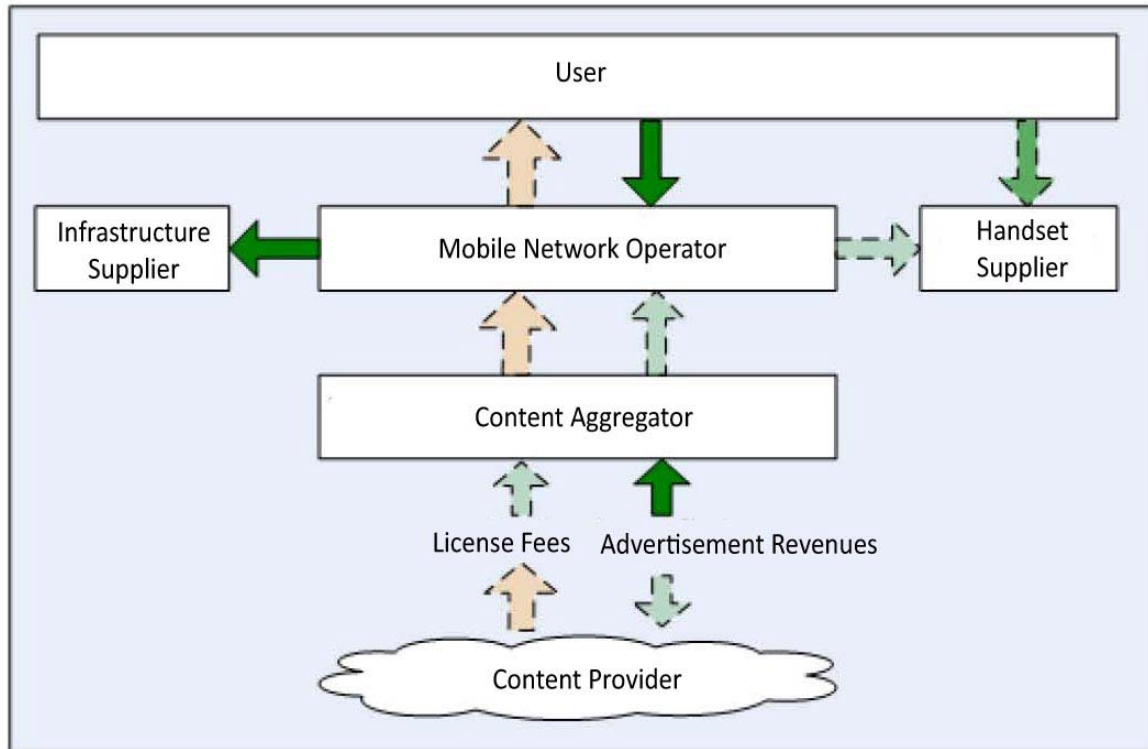
Figure 8: Properties of broadcasters and MNO's, illustrating how they complement each other

Given these characteristics of broadcasters and mobile network operators, the logical solutions would be that they cooperate to create mobile TV services. As mentioned earlier in this report, re-use of existing mobile networks is the fastest way to deploy a mobile TV service today. Even though broadcast solutions have a higher capacity, the main assets of the MNO like existing subscriber base and infrastructure makes them the best candidate for a key position in the value chain. The strongest quality of the broadcasters is the experience of providing attractive content, which has proven to be crucial to the success of mobile TV.

However, if they choose not to cooperate the following scenarios are likely to occur, here summarized with key issues to address. The illustrations show the primarily cash flow in the actor network with green arrows, red arrows are content.

⁴⁸ Gartner 2006

5.4.1. Mobile operator centric scenario – MBMS



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Figure 9: Value chain of a 3G/MNO scenario

Summary of challenges and opportunities:

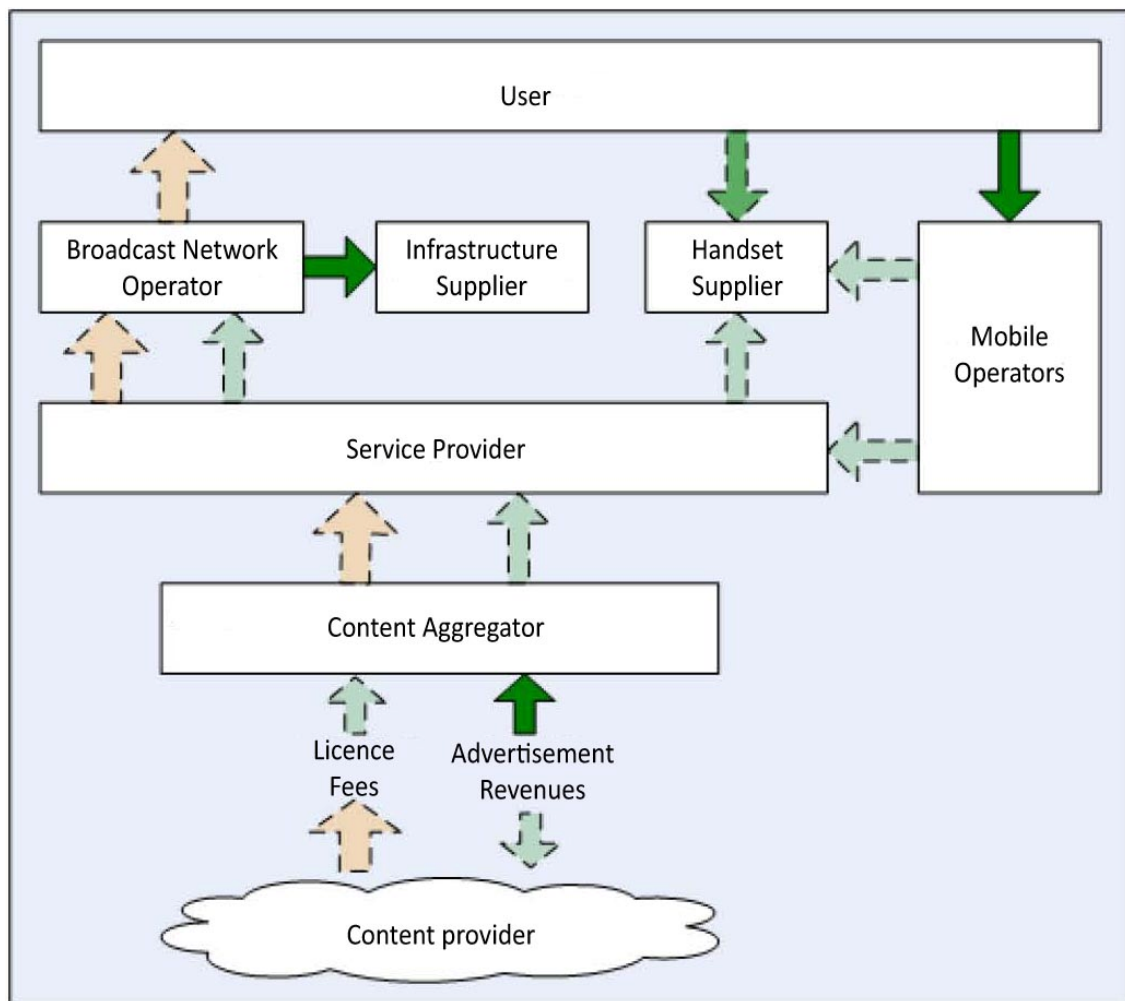
- **Technology not fully developed.** The capacity in MBMS services is still low compared to broadcast technologies due to the smaller spectrum requirements with a lower number of channels/spectrum as a result. There are also a number of issues around integrating the technology onto existing mobile telephony infrastructure. Investments in multicast support like MBMS are however necessary for any operator that wants to deploy mobile TV services because unicast services are not cost-effective, not even using third-generation networks.
- **Collaboration around content needed.** Since a MBMS solution is focused on the mobile network operator, a player traditionally not focused around content, they need to establish cooperation with traditional content providers and aggregators (TV channels, newspapers etc) to assure high-quality content in their service. This can weaken the mobile operator's role in the value chain.
- + **Infrastructure and spectrum already in place.** The advantages in re-using already allocated spectrum and built infrastructure are clear in an economical point-of-view. This solution is much cheaper and gives a greater coverage than broadcast technologies. Present 3G-handsets could also support this type of distribution. Presenting mobile TV services using

⁴⁹ Netlight 2006

mobile networks also gives mobile operators an application that can fill the over-capacity in the present networks, making them more likely to invest money in the development, resulting in a higher probability for mobile TV services to reach a broad market.

- + **Mobile operators have full control.** Mobile operators already have the necessary billing systems, user information and handset support required. If they also could control the content this would make them an even more powerful player on the market.

5.4.2. TV operator centric scenario - DVB-H



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Figure 10: Value chain of a broadcast scenario

Summary of challenges and opportunities:

- **Spectrum availability.** A DVB-H based mobile TV service would require the building of a new network based on the DVB-H technology, something that would need available spectrum. This would require a total investment of 1 400 MSEK to achieve a 90 percent coverage of Swedish households. This includes a network of around 600 broadcasting units, transmission

⁵⁰ Netlight 2006

networks, multiplexors together with 400 repeaters to assure in-door coverage.

- **High costs and thresholds for customers.** Since the technology standardization battle is not over yet, there are some standards still competing for market domination. It is possible that handsets in the future will contain a number of receivers for mobile TV (DVB-H, DMB, FLO etc), resulting in expensive handsets. It also makes it hard for handset manufactures to predict the development, resulting in a lack of appropriate handsets that could slow the user take-up.
- + **High capacity and scalability.** A broadcast solution for mobile TV services is the most effective and scalable alternative making it possible to broadcast a large number of channels and content over a large area to a lot of simultaneous users. Future development in codecs and transmission technologies will also allow even more efficient use of spectrum.
- + **Perceived quality of the service.** Broadcasted mobile TV has a very high quality in image and sound, making the overall experience more appealing.

5.5. Summary

- The two main candidates for a key position in the value chain are TV broadcasters and mobile network operators.
- Broadcasters possess the experience to produce high quality content but lack a good distribution channel and connection to the customer.
- Mobile network operators have a strong position by owning and controlling the mobile networks with access to customers.
- The obvious and most effective solution would be for broadcasters and MNO's to cooperate to gain each others strengths and neutralize the weaknesses.
- A solution based on an HSDPA/MBMS upgrade of the cellular networks enables a fast launch of services and a possible first mover advantage.

6. Discussion

6.1. Thoughts on the results

Given the circumstances and research question, the results give a clear view of the problems involved in launching mobile TV in Sweden. The combination of key learning from international trials and deployments together with first hand input from the whole Swedish actor network gives a high credibility and prides a good coverage of problems. Both the overall research question and the sub-questions are in my opinion well answered by this approach.

However, the fast pace of the development in this business makes it hard to keep track of everything that happens. The communications and entertainment industry today is global and the perspective international, making it very difficult to overview. The fast development also makes data or input of any kind older than say three year more or less outdated and useless. The same goes with this thesis, in a couple of months it will need to be revised and updated to be accurate.

6.2. Reflections on methodology

Due to the complexity of the issue at hand, give a “complete” overview of the different factors that affects mobile TV, it is hard to find a research method that covers all possible angles. To solve the problem, a combination of international best practice applied to the properties of the local Swedish market is required. Since the concept of mobile TV still is rather new and not wide spread, it is firstly hard to find good analysis and reports on the subject and also somewhat hard do find people in Sweden that actually know anything valuable related to mobile TV.

This later point became clear during the workshop session. Some participants did not know more than the basic information and listened more than they provided to the discussion. Also the selection of participants to the workshop became somewhat biased due to this with a higher representation of smaller, more fast-moving actors that tend to adopt these new trends quicker (much like the Roger’s Diffusion of Innovation, but applied to market actors). It would have been good for objectivity to have both representatives from Ericsson and Nokia, Telia, Telenor, Tele2 and Tre, present at the same time. This would probably be impossible to achieve and even if it would be arranged, not likely led to very open-minded and sharing discussions, which was the ultimate goal.

Proposals for future research

So the conclusion is that there still remains some work to be done before mobile TV is considered a mainstream media. Future research could look at the process of technology standardization with mobile TV as a good example of international and political influences over technology. As mentioned earlier actor network alliances and collaboration is crucial to the success of mobile TV, this is an area that could be further investigated.

But in the end, putting the service out there, available for the customer is the only way to ever know for sure if mobile TV is a future killer application for mobile phones.

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7.3. Internet resources

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TELENOR, 2007-05-25, <http://www.telenor.se>

TRE 2007-05-25, <http://www.tre.se>

7.4. Seminars

Nordic Telecom Days, 18 September 2006, Kista Science City

Theme: IP- and Mobile TV.

Speakers and panelists:

Johan Lindgren, VD, Telenor Group

Marie Ahlgren, Exido

Jan Hedlund, Microsoft

Anders Bergtoft, Ericsson AB

Johan Rosenlind, Nokia

Karianne Melleby, Telenor Norge

Jørgen Michaelsen, Technical Vice President, TDC Kabel TV A/S

Mats Erixon, Media specialist, KTH

Mobile TV seminar, 14 November 2006, IVA Näringslivets hus, Stockholm.

Speakers and panelists:

Jens Zander, professor, Wireless@KTH

Lars Backlund, director of strategic development, Teracom

Per Nordlöf, strategy director for mobile TV, Ericsson

Per Andersson and *Christopher Rosenqvist*, Centre for Communication and Information Research, Stockholm School of Economics

Anders Jensen, Market director, Telenor

Pontus Bergdahl, CEO, MMS

Lena Glaser, director, SVT-I

7.5. Workshop

Mobile TV Workshop, 30 November 2006, Focus Inn, Tegnérsgatan 34, Stockholm.

With over 20 representatives from the Swedish mobile TV actor network, addressing key issues around consumer behavior, business models, technologies and content. For more detailed information on the workshop, see chapter 4.1 in this report.

7.6. Interviews

Niclas Lidström, Tidningen Mobil (061110)

Marie Nilsson, Mediavision(061020)

Henrik Pålsson, Ericsson (070209)

Bartek Gudowski, Viasat (061010)

Sofia Svateson, Ocean Observations (061116)

8. Appendix

8.1. Glossary

Band III

Band III is a frequency band within VHF between 174-230 MHz.

Broadcasting

The term broadcasting denotes a simultaneous transmission of a message, or in special circumstances, a video or TV transmission from a transmitter to several recipients.

DAB

Digital Audio Broadcast is a method of broadcasting radio signals digitally and terrestrially to static and handheld receivers/devices. It is marketed in Germany as Digital Radio.

DMB

DMB stands for Digital Multimedia Broadcast and it's a transmission system for sending data, radio and TV to mobile devices. DMB can operate via satellite (S-DMB) as well as terrestrial (T-DMB) transmission. The spec is yet another competitor to DVB-H and MediaFLO, but it is more like the former than the latter. T-DMB uses the MPEG-4 format for video. Germany will launch a T-DMB trial for the World Cup in 2006 and the U.K., Switzerland and Italy are all looking to do so this year as well. Paris already has a trial underway as does South Korea, which is testing both S-DMB and T-DMB.

DVB-H

DVB-H stands for Digital Video Broadcasting "Handheld and it's the European home-grown standard for broadcasting mobile television to handheld receivers, like mobile phones. The spec does not require a carrier's network since it is a broadcasting technology it travels through the air so it is not limited to phones alone. On the other hand, it requires a separate receiver within the handset. ETSI adopted the standard for DVB-H in November 2004 but launches are only just beginning in 2006 in places like Italy, the U.S. and Finland. The Mobile Digital Television Alliance or mDTV Alliance was formed in 2005 and is pushing for the adoption of DVB-H. The group is comprised of vendors across the mobile TV value chain. As far as R&D dollars and headlines go, DVB-H's main competitor is Qualcomm's MediaFLO technology, which, like DVB-H, does not run over a carrier's network but in FLO's case, it requires its own.

DVB-T

DVB-T is a digital broadcasting standard for TV to primarily static receivers. This digital standard is meant to replace analogue, terrestrial television in Germany.

DXB

Digital Extended Broadcast Standard should, in future, unite DMB and DVB-H technologies and could, therefore, end the technological disputes between the followers of these standards.

EDGE

Enhanced Data rates for GSM Evolution. EDGE has been developed for those networks that didn't but a UMTS license and while it promises only about a third of the bandwidth, most UMTS services will also have a form using EDGE. Speed of upto

184kbps will be possible.

EPG/IPG

IPG, EPG or ESG stand for interactive program guide, electronic program guide and electronic service guide, respectively. The terms all refer to an on-screen guide to broadcast television programs that allow the viewer to navigate, search and order content, whether from cable, satellite, IPTV services or mobile television. The EPG is an integral driver and enabler of the trend toward greater personalization and customization of video content. The first genesis of the EPG came in the form of on-demand content from cable companies, but this service is evolving to include databases of advertisements, interactive yellow pages and other services.

Frequency band

A frequency band is a coherent frequency area which is distinguished by the same transmission characteristics. Frequency bands are denoted by letters of the alphabet.

GPRS

General Packet Radio Systems. GPRS is hailed as the 2.5 for mobile phones and will be with us from the beginning of 2001. GPRS will give you a permanent connection at about 50kbps or so to your mobile phone.

GSM

Short for Global system for Mobile Communications, it is the mobile phone platform used in Europe and much of the rest of the world- though it is not mainstream in the USA. Dual band phones are capable of operating on other bandwidths abroad.

HSDPA

High-Speed Downlink Packet Access, an upgrade for WCDMA / UMTS networks. It doubles network capacity and increases download data speeds five-fold or more. While the technology is theoretically capable of downlink (download) data rates up to 8-10 Mbit/s (million bits per second), initial deployments and devices will be limited to 1.8 Mbit/s, followed by network upgrades and new devices capable of 3.6 Mbit/s. HSDPA is standardized by the 3GPP in UMTS Release 5.

L-Band

L-Band is a frequency band between 1450 GHz and 1500GHz.

MBMS

Multimedia Broadcasting Multicasting Service. Enables one source to simultaneously send data, such as video or audio programming, to multiple users who subscribe to the service.

MediaFLO

MediaFLO is a Qualcomm suite of products that makes use of FLO, forward link only, technology used for mobile TV broadcasts. Some details of the specs capabilities include QVGA 30 frame-per-second quality, according to Qualcomm. The standard is receiving a lot of pushback in Europe which favors its homegrown DVB-H spec. Some have compared the two technologies to other competing technologies like CDMA and GSM. While some criticize FLO for not having interoperable partners, Qualcomm says it plans on releasing those partners in short order. Also, much of the FLO technology was invented in Europe so the talk of Europe vs. American technology is a little off the mark.

Mobile TV provider

A mobile TV provider's role is to talk to and cooperate with all parties required to implement mobile television. This includes, amongst other things, obtaining the broadcasting and media licences, ensuring that networks are developed and the development and aggregation of content and the sale of products to consumers.

UHF

UHF means Ultra High Frequency and is a frequency band. It is, for example, this frequency band via which DVB-T TV signals are transmitted.

UMTS

Universal Mobile Telecommunications Systems“ is often referred to as the third generation (3G) mobile telephony standard. The 3G standard which transmits data via a mobile telephony network, theoretically allows a data rate of up to 2Mbit/s. In reality, however, only a maximum of 384 Kbit/s can be downloaded. UMTS is based on a standard called W-CDMA. UMTS is suitable for transmitting multimedia content to handsets but is not suitable for mobile TV as it only allows a limited number of users.

TDtv

TDtv is another mobile TV solution that IPWireless developed and unveiled recently. TDtv operates in universal unpaired 3G spectrum bands that are available throughout Europe and Asia: 2010 MHz and 1900 MHz. The technology allows UMTS operators to use their existing spectrum and infrastructure to offer mobile TV services. Most of the other options do not rely fully on the carrier networks themselves to deliver mobile TV services and since many carriers intended to build out 3G services to enable a data-rich experience for the end user, TDtv has quickly gotten a lot of headlines. IPWireless claims operators can offer up to 50 channels for standard mobile phone screens or 15 QVGA quality channels. TDtv also leverages MBMS to allow greater scalability.

VHF

VHF means Very High Frequency and is a frequency band. L-band and band 3 are located in this frequency band.

Visual radio

bigFM2see's visual radio concept is one of a kind in the world. Thanks to this new concept radio programmes which are being aired can be supported by pictures, in the form of a slideshow. In addition, interactive features mean that listeners have the opportunity to directly influence the programme.

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8.2. Workshop material (in Swedish)

Invitation to participants

Mobil TV Har Du bilden klar för Dig?

30 November 2006

April 2006:

"By 2016, mobile television in Europe could be a €24 billion market and reach more than 190 million users [...]"

- The McKinsey Quarterly

INBJUDAN
WORKSHOP
MOBIL TV



Handelshögskolan i Stockholm
Kungliga Tekniska Högskolan

Sällan har ett nytt medium fått så mycket uppmärksamhet på så kort tid. Mobil TV – ny bubbla eller framtidens kassako? Nu kan Du vara med och påverka.

Du är härmed välkommen att delta i en workshop på temat mobil TV och dess framtid **torsdagen den 30 november 2006**.

Den etablerade mediabranschen har redan satts i rörelse; pilottester är i full gång, medierapporteringen likaså. Många är idag intresserade av mobil TV och ser stor potential i tekniken, men få kan egentligen uttala sig om vad rörlig bild i mobilen faktiskt innebär för morgondagens företag och konsument. Du erbjuds nu en möjlighet att delta i ett unikt forum som angriper just dessa frågor. Var med och diskutera, dra lärdomar, bidra med erfarenheter och knyt nya kontakter.

Genom Ditt deltagande kommer Du få ta del av insikter från nyckelintressenter i alla delar av värdekedjan – från teknisk infrastruktur till innehållsproduktion – samt den senaste forskningen i ämnet från HHS och KTH. Vad vill kunderna ha? Vem betalar för det? Och framför allt: hur kommer kakan att fördelas?

Arrangemanget utgör en del i ett större forskningsprojekt med syfte att studera teknologi, strategi och kundbeteende kring nya mobila medier. Projektet bedrivs gemensamt av Center for Information and Communications Research vid Handelshögskolan i Stockholm och Wireless@KTH vid Kungliga Tekniska Högskolan. Som deltagare får Du och Din organisation givetvis även ta del av de rapporter som projektet resulterar i.

Programmet består av en serie diskussioner om 4x45 minuter på följande teman:

Kundbeteende

Vad vill kunden ha?

Mobil TV möjliggör ökad personlig interaktion och kontakt. Vad vill konsumenterna egentligen se i mobilt format? Frågor kring när och hur de tittar samt hur detta kan mätas tas upp.

Innehåll

Hur paketeras tjänsten?

Mobil TV kan vara vanlig TV i litet format – eller någonting helt nytt. En rad frågeställningar kring upphovsrätt och licenser måste adresseras, liksom reklamens roll och utrymme.

Teknik

Befintlig teknik eller bygga nytt?

Dagens teknik medför både möjligheter och begränsningar. Det finns idag en rad frågetecken kring vilken standard som är bäst lämpad för distribution av mobil TV.

Affärsmodell

Hur kan vi tjäna pengar på det?

Nya förutsättningar kräver nya affärsmodeller. Hela värdekedjan har intresse av att hitta innovativa sätt att skapa intäkter. Med mobil TV kan såväl samarbetspartners som konkurrenter tillkomma och falla bort. Vem vinner och vem förlorar?

Workshopen är kostnadsfri och äger rum på Focus Inn, Tegnérgatan 34, Stockholm

Vi bjuder på enklare förtäring.

Anmälan sker senast 16 november, till mobiltv@hhs.se

Väl mött den 30 november!

Antalet platser är begränsat och först till kvarn gäller.

För ytterligare information kring forskningsprojektet besök <http://www.wireless.kth.se/projects/MTV/>.

Moderator script and guidelines

8.2.1.1. Några riktlinjer

- Nedanstående frågor är sådant som vi på förhand bedömt som intressant. Det finns dock inga krav på att hinna med alla punkter.
- Lyssna och bedöm huruvida det aktuella ämnet får fart på deltagarna eller inte. Om inte – gå genast vidare.
- Sidospår är enbart intressanta om de är relevanta och bidrar till syftet med workshopen. Avbryt vänligt men bestämt om deltagarna frångår ämnet.
- Försök att läsa av vilka som pratar mer än andra och skapa en balanserad diskussion. Monologer passar bättre på föreläsningar och predikningar.
- **UTNYTTJA TIDEN EFFEKTIVT!**

8.2.1.2. Teknik

- Vad är mobil TV? Vanlig, tabblagd TV eller något annat?
 - Vilka huvudsakliga för- respektive nackdelar finns med det mobila formatet?
 - Broadcast eller streaming, i vilka fall bör man använda det ena eller det andra?
- Vem bör bygga och bekosta ett dedikerat broadcast-nät? Operatörer, TV-bolag eller en neutral nätägare?
- Vilka faktorer påverkar förutsättningarna för en teknisk lösning? (Ur olika aktörsperspektiv)
 - *Kund/marknads-perspektiv*: Vad karakteriserar förutsättningarna på den svenska och skandinaviska marknaden? Hur påverkar detta teknikvalet?
 - *Innehåll*: Vilken typ av innehåll passar bäst i mobila formatet, hur bör man ta hänsyn till detta vid val av teknik?
 - *Affärsmodeller*: Vilka affärsmodeller är bäst tillämpbara på en mobil TV-tjänst, finns stöd för dessa i tillgängliga tekniska lösningar?
 - Kommer man att behöva skydda/koda sändningar av mobil TV?
- Innan Ni väljer att satsa på mobil TV, vilka frågor återstår att lösa när det gäller tekniken?

8.2.1.3. Kundbeteende

- Hur får man kunderna att använda olika funktioner i mobilen?
- Vilka är de främsta konkurrenterna? Tidningar? Mp3? PSP?
- Att fördriva tiden och att vara uppdaterad är två stora användningsområden. Hur får man mobil TV att vara konkurrenskraftigt inom dessa områden?
- Är mobiltelefoner eller mobila enheter huvudmarknaden?
- Är bildkvalitet ett problem? Duger verkligen dagens kvalitet?
- Är det intressant att erbjuda fler kanaler i mobilt format till ett lägre pris? Om det är så att det är det totala utbudet som driver efterfrågan.
- Ska man profilera mobiltelefoner som tv-mobiler?
- Hur får man kunder att interagera?
- Hur tror ni att fördelningen mellan streaming och broadcast kan komma att se ut? Varför?

- Går det verkligen att motarbeta inspelning om streaming bara är ett komplement? Jfr. vanlig tv där IPTV anses vara nästa grej.
- Folk tittar mest när de pendlar, hur får man folk att titta vid andra tidpunkter?
- Hur får man folk att titta längre vid varje tillfälle?
- Hur får man folk att titta vid fler tillfällen?
- Vad är användarvänlighet i sammanhanget?
- Hur gör man push till ett bättre alternativ?

8.2.1.4. Innehåll

- Vilken typ av innehåll (genrer) kommer att vara mest attraktivt i början? På sikt? Kommer innehållet i stort att kunna spegla det marksända utbudet?
- Hur kan mobilt innehåll tänkas påverka det marksända utbudet på sikt?
- Hur ska tv med sitt innehåll hävda sig gentemot andra medier i mobilen såsom musik, spel och web?
- Vilka format är lämpliga? Hur pass mycket ska man "skräddarsy" innehållet?
- Vilken potential finns i att erbjuda unikt/exklusivt innehåll i mobilen? Kommer man bry sig om att producera det?
- Hur ser premium content i mobilen ut?
- Vem ska få ha rätt att sända den populära serien X till mobilen? TV-kanalen? Operatören? Ska alla medier ingå i rättighetspaketet eller ska det säljas separat?
- Tidsåtgången för användning av mobiltelefoner är betydligt mer "dynamisk" än många andra medier. Användningstiden kan variera mellan någon enstaka sekund och flera timmar. Hur bör innehållets längd anpassas utefter detta mönster? Vad är möjligt, vad är rimligt?
- Hur och när bör reklam förekomma i förhållande till innehållet?
- Har lokal-tv en annan potential i mobilen än i det marksända nätet?
- Hur stor roll spelar användarnas eget innehåll? Kommer vi att se YouTube eller MySpace i mobilen? Kan mobilen bli ett helt fritt medium likt webben?

8.2.1.5. Affärsmodeller

*) indikerar att frågan är viktig, mycket tyngd på dessa. Fördjupa/utöka diskussionen genom att följa upp med vidare frågor och förtydliganden osv.

- Är det här en ny värld eller en förlängning av det traditionella tv-formatet? [Oklart om detta hör till affärsmodeller, men ändå.]
 - Jmf "Lena Glaser-modellen" – överskatta kortsiktiga effekterna, underskatta de långsiktiga.
- *) Vilka ser ni som de dominanta aktörerna i en tänkt värdekedja för leverans av rörliga videotjänster i mobilen till konsumentmarknaden?
 - Tror ni att vi kommer att få se nya aktörer etablera sig i värdekedjan? (Ev. förtydliga med YouTube/MySpace osv; "portaler för "konsumentskapad content.)
 - Riskerar några aktörer att falla bort? Vilka? Varför?
- *) Vad ser ni för primära intäktskällor för de olika aktörerna [**Stor fråga, viktig diskussion. Att slänga in för att få fart på diskussionen: intäkter från reklam, fasta priser för abonnemang, pris för mängd dataöverföring, annat?**]
- Hur ser ni de traditionella tv-kanalerna skapa sig plats/marknadsutrymme i en mobil plattform när...
 - ...innehållet sänds i det traditionella tabblagda formatet?
 - ...innehållet streamas?
- *) Vad ser ni för potential för mobila videotjänster positionerade mot en företagsmarknad?

-
- Hur kan företag använda rörliga bilder i mobilen för att kommunicera internt resp.externt?
 - Utveckla med nedanstående vid behov:
 - Internt: FedEx
 - Kunskapsuppdatering/spridning
 - PR i detta format (tänk pressmeddelanden etc.)
 - Viral marketing – sprida många, korta budskap i videoformat
 - Dokumentärt format → nya möjligheter till kommunikation (ej payoff på samma sätt)
 - Vad ser ni för tidshorisonter för när mobila videotjänster av detta slag kommer att slå igenom på denna marknad?
 - När ser vi det först; vem och i vilken form?
 - När gör "alla" det? (Om någonsin...)

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