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**FUNCTIONAL EXTENSIONS TO MOBILE OPERATOR  
BUSINESS GAME**

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## ABSTRACT OF THE MASTER'S THESIS

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<p>Finland has been a forerunner in mobile communications for years. However, the situation has changed and the competition has become extremely tough. Other markets, especially the Japanese and the South Korean markets, are now in leading positions. Deregulation and liberalization has been a trend in telecommunications, and Finland has been a forerunner also in these areas.</p> <p>The Finnish mobile services market has not been able to take full advantage of the opportunities related to mobile data and mobile Internet. The motivation for this study derives from this observation and from the objective of Networking Laboratory to develop new methods for teaching the dynamics of mobile services markets to students, and to gain better insight into the mobile operator business and how to model it into a domain specific business game (Mobile Operator Business Game, i.e. MOB).</p> <p>The research question to be answered in this study is stated as follows: <i>How should the mobile content, the roaming, the MVNO, and the handset businesses be modeled into the domain-specific business game MOB?</i> The study is mainly focused on the Finnish mobile communications market, but some characteristics of other markets are also studied. In addition to the main objective of this research, as described above, special interest is also put on making MOB more user-friendly and playable. This includes redesign of already implemented modeling, improvements to the user interface, and production of user documentation.</p> <p>Feedback and experiences about MOB have been gained through testing. According to the feedback MOB seems to be able to convey many important lessons that would be hard to give via traditional teaching and lecturing. It also motivates the players to really learn the "tools" that they might have undervalued before. Feedback also indicated that the aspects mentioned in the research question actually are worth modeling into MOB.</p>		
<b>Key words:</b>	Mobile operator, business game, MOB, usability, mobile content, MVNO, roaming, handset subsidy	

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<p>Suomi on jo vuosia ollut matkaviestintäalan edelläkävijä, mutta tilanne on muuttunut ja kilpailu alalla on koventunut. Muut markkinat, kuten Japani ja Etelä-Korea, ovat tällä hetkellä johtavassa asemassa. Markkinoitten vapauttaminen on ollut trendi televiestintäalalla, ja myös tässä Suomi on ollut edelläkävijä.</p> <p>Tämän tutkimuksen vaikuttimena on ollut kaksi asiaa. Ensinnäkin, Suomi ei ole pystynyt hyödyntämään matkaviestinnän datapalveluiden tuomia mahdollisuuksia. Toiseksi, Tietoverkkolaboratorion pyrkimys kehittää uusia opetuskeinoja joilla matkaviestintäpalvelualan ominaispiirteitä voisi paremmin opettaa opiskelijoille, sekä saada parempi käsitys matkapuhelinpalveluoperaattoriliike-toiminnasta ja miten sitä voisi mallintaa yrityspelissä (Mobile Operator Business Game, eli MOB).</p> <p>Kysymyksenasettelu tässä tutkimuksessa on: <i>Miten matkaviestinnän sisältöpalvelu-, MVNO-, verkkovierailu-, sekä päätelaitetoiminta sisällytetään aluespesifiseen MOB yrityspeliin?</i> Tutkimuksessa keskitytään pääosin suomen matkaviestintämarkkinoihin, mutta joitakin muilla markkinoilla esiintyviä tunnusomaisia piirteitä tarkastellaan myös. Yllä olevan päätavoitteen lisäksi keskitytään myös MOB:in kehittämiseen, tehden tästä käyttäjäystävällisemmän sekä paremmin pelattavan. Tämä käsittää jo olemassa olevien mallien ja käyttöympäristön parantamisen sekä käyttöohjeen tuottamisen.</p> <p>Testauksen kautta on saatu palautetta ja käyttäjäkokemuksia MOB yrityspelistä. Palautteen mukaan yrityspelin avulla voidaan opettaa monia asioita joita ei tavallisen opetuksen ja luennoitsemisen kautta voida opettaa. MOB myös motivoi pelaajia oppimaan ne ”työkalut” joita he ovat aikaisemmin aliarvioineet. Saatu palaute myös indikoi että tutkimuskysymyksessä mainitut asiat ovat tarpeellisia muutoksia MOB:iin.</p>		
<b>Avainsanat:</b>	Matkapuhelinpalveluoperaattori, yrityspeli, MOB, käytettävyys, matkaviestinnän sisältöpalvelut, MVNO, verkkovierailu, päätelaitteen subventio	

## **PREFACE**

The Master's Thesis that you are currently holding in your hand represents the final part required for my Master of Science degree in Engineering at the Helsinki University of Technology. This work has been carried out starting in October 2003 and ending in March 2005 at the Networking Laboratory at the Department of Electrical and Communications Engineering.

I want to thank a number of people who have been to my support and influenced me and my learning during my years of study at the Helsinki University of Technology.

First and foremost I want to thank the Networking Laboratory and professor Heikki Hämmäinen for giving me the opportunity to extend my knowledge in the mobile communications business and business games. I also want to thank Juusi Töyli for his assistance in the world of business games and simulations. A warm thank you goes also to the Networking Business team members at the Networking Laboratory.

Finally I also want to thank my family and friends, especially my girlfriend Mia. Thank you for all your support and understanding.

Mathias Tallberg

Helsinki, March 17, 2005

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## ABBREVIATIONS

2G	2 <sup>nd</sup> Generation of cellular (GSM)
2,5G	2,5 Generation of cellular, (GPRS)
3G	3 <sup>rd</sup> Generation of cellular, (EDGE and UMTS)
3GPP	Third Generation Partnership Program
ADSL	Asymmetric Digital Subscriber Line
ARPU	Average Revenue Per User
CDMA	Code Division Multiple Access
DRM	Digital Rights Management
EDGE	Enhanced Data rates for Global Evolution
EMS	Enhanced Messaging Service
EU	European Union
FICORA	The Finnish Communications Regulatory Authority
GPRS	General Packet Radio Service
GRX	GPRS Roaming eXchange
GSM	Global System for Mobile Communications
HSCSD	High Speed Circuit Switched Data
HTTP	HyperText Transfer Protocol
ICT	Information and Communications Technology
IP	Internet Protocol
LEAD	Optimal Rules for Leading Mobile Data Markets
MEUR	Million Euros
MIDP	Mobile Information Device Profile
MMS	Multimedia Messaging Service
MMSC	Multimedia Message Service Center
MNO	Mobile Network Operator
MNP	Mobile Number Portability
MOB	Mobile Operator Business game
MoU	Memorandum of Understanding
MSO	Mobile Service Operator
MVNO	Mobile Virtual Network Operator

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OMA	Open Mobile Alliance
PoC	Push to talk Over Cellular
PWLAN	Public WLAN
SMP	Significant Market Power
SMS	Short Messaging Service
SMSC	Short Message Service Center
TCP	Transmission Control Protocol
TEKES	National Technology Agency of Finland
TKK	Helsinki University of Technology
UK	United Kingdom
UMTS	Universal Mobile Telecommunications System
VAT	Value Added Tax
WAP	Wireless Application Protocol
WCDMA	Wideband Code Division Multiple Access
WLAN	Wireless Local Area Network
WWW	World Wide Web
XHTML	eXtensible HyperText Markup Language

# Part I

## 1 INTRODUCTION

### 1.1 *Motivation for the Research*

Finland is without argue, one of the most mobile phone and mobile service obsessed countries in the world. Finland has been a forerunner in mobile communications for years. However, the situation has changed and is changing as we speak.

Competition in the mobile operator business has become extremely tough and it seems that companies need to be extremely competitive to be able to survive. The prediction of what will happen in the future has become very difficult. Deregulation and liberalization has been a trend in telecommunications, and Finland is a forerunner also in these areas.

New business models have emerged. For example, due to the favorable regulation new entrants can more easily start competing with traditional mobile operators, as so called mobile virtual network operators (MVNO). A MVNO usually targets specific segments of the market, e.g. price-averse consumers and corporations.

Finland was the global leader in the mobile communications during the growth of voice services. The success of many of the Finnish players in mobile communications was possible because of this leadership. This is unfortunately not true anymore. After the introduction of mobile data services (2,5G and 3G), the situation has changed significantly. Other markets, especially the Japanese and the South Korean markets, are now in leading positions.

Finland has not been able to take full advantage of the opportunities related to mobile data and mobile Internet. Something needs to be done to put Finland back on track, i.e. to catch up with, and hopefully pass, the currently innovative and leading markets and making it possible for Finland to once again capture the leading position in mobile communications.

The motivation for this study derives from the mission of the Networking Laboratory at Helsinki University of Technology (TKK) to gain a better insight into the mobile operator business, especially the Finnish one, and how to model this business into a domain specific business game, i.e. the Mobile Operator Business game (MOB). At the beginning of this research MOB was in an early prototype stage (Kokko, 2004).

The business game is part of a bigger whole, namely the LEAD (Optimal Rules for a Leading Mobile Data Market) research project that is studied at the Networking Laboratory at TKK. The main objective of the LEAD project is to produce tangible action proposals for speeding up the adoption of new mobile

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data services in Finland. This boils down to removing business obstacles that inhibit the rapid deployment of technology innovations and the rapid fulfillment of consumer needs. The result is “a better health of networks” allowing a balanced win-win situation to parties involved. Parties involved in the LEAD project are Nokia, TeliaSonera, Elisa, DNA Finland, TEKES, and FICORA. (Hämmäinen, 2003)

## **1.2 Research Problem**

The research problem of this study is to model the following aspects of the mobile operator business into MOB:

- The mobile content business;
- The roaming business;
- The MVNO business;
- The handset business.

The research question for this study is defined as follows: *How should the mobile content, the roaming, the MVNO, and the handset businesses be modeled into the domain-specific business game MOB?*

## **1.3 Objectives of the Research**

MOB models the business and markets of mobile operators, with special focus on the business dynamics of new data services. The main objective of this research is to define and model extensions to MOB. In addition to the main objective of this research, special interest is also put on making the business game more user-friendly and playable. The secondary objective of this research is to improve MOB and to gain experiences through testing. This includes redesign to already implemented models and making MOB as playable as possible e.g. by producing user documentation.

## **1.4 Scope of the Research**

The geographical scope of this thesis is mainly Finland and the Finnish mobile communications market, but also other markets are studied. The implemented business game is domain specific and the domain is the mobile operator business. The area of focus is not divided in any way, i.e. every aspect about the mobile operator business concerning mobile content, roaming, MVNO, and handsets are considered and studied.

Technologies and possible solutions for the GSM family of wireless technology, i.e. GSM, GPRS and EDGE, through future developments into UMTS, as well as the SMS and MMS mobile services belong to the technological scope of this study. WLAN, which is becoming more and more important for the mobile operator due to its complementary coverage and higher bandwidth, is also taken into account.

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## 1.5 Methodology

The methodologies used in this study are:

- Literature study;
- Modeling based on the literature study;
- Redesign and testing of MOB;
- Gathering of user feedback through questionnaires.

The literature study concentrates on the mobile content, roaming, MVNO, and handset areas of mobile operator business. Short descriptions about the mobile operator business and business games are also included.

The construction and testing of the computer models in MOB are made in three phases:

- The modeling of the needed new aspects of the mobile operator business as to be used in a business game;
- The implementation of the constructed models into the business game;
- Validation of the models and MOB through testing.

The validation of the models and the business game MOB as a whole is made by the participants to voluntary game sessions for the course *S-38.041 - Networking Business* lectured during the spring 2004. The participants in the Networking Business course can not only give feedback about the modeled items in MOB, but also on the usability and playability of the game. The validation of the mobile content, MVNO, roaming, and handset businesses is not a result of the game sessions held during the Networking Business course. But, their importance is analyzed with the help of feedback gained from the sessions.

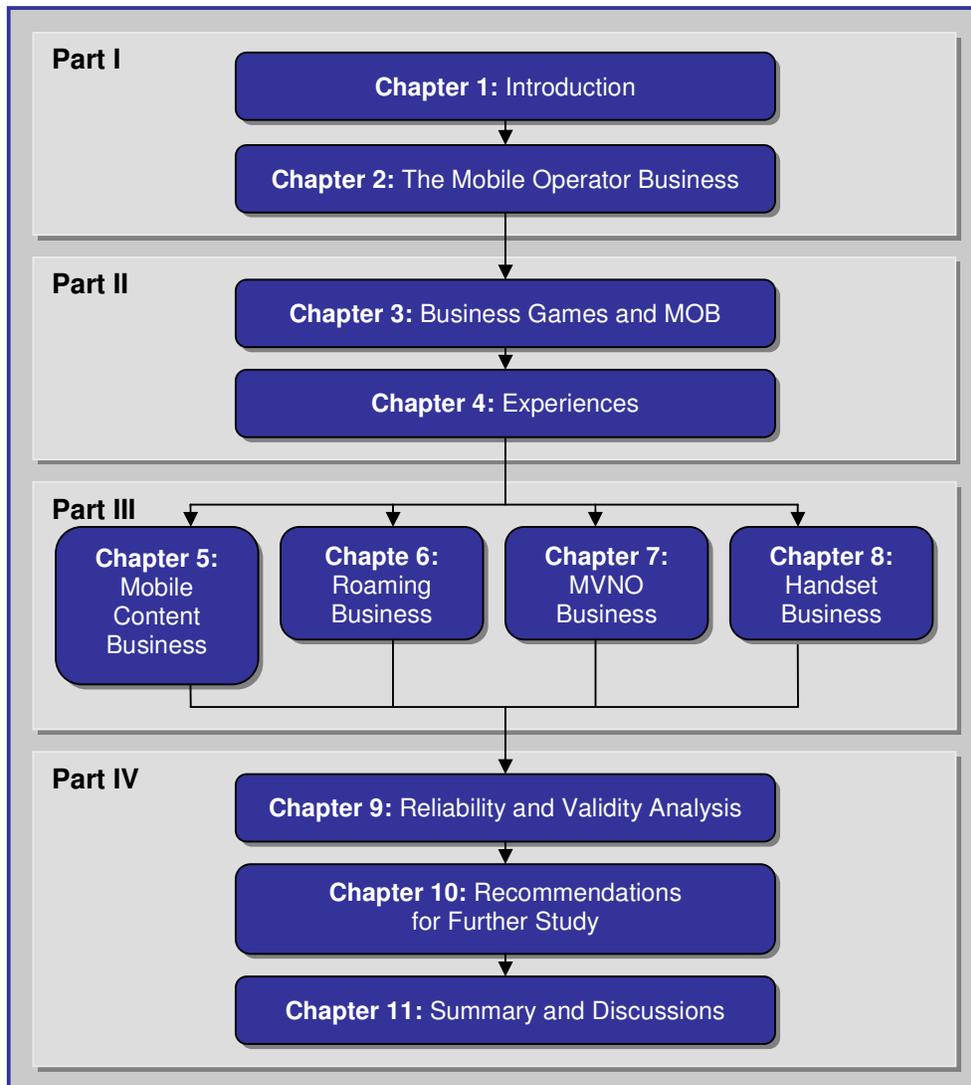
## 1.6 Structure of the Study

The structure of this master's thesis is outlined in Figure 1. Part I begins with an introduction and continues with a short and general description of mobile operator business.

Part II concentrates on the world of business games and gives also a description of the current MOB implementation. At this point usability issues of MOB are also discussed as well as the experiences gained during the testing phase.

Part III is about the new business aspects modeled for MOB. There are four chapters and each of these is about one of the issue, namely the mobile content, roaming, MVNO and handset businesses. These chapters give a description about what these are about and closing with how these could be modeled into MOB.

The last part includes reliability and validity analysis, recommendations for further study, and summary and discussion. The player instructions and additional material from the sessions held during the Networking Business course are included in the appendices.



**Figure 1.** The structure of the thesis.

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## 2 MOBILE OPERATOR BUSINESS

### 2.1 *Global Situation*

The competition in the mobile operator business is fierce. It is one of the most competitive sectors of telecommunications as a whole. Mobile operators need to consider very carefully how to spend their money, because the business is about big investments and there are many things that can go wrong when acting in this business. As evidence of this, one does not need to look further than to the UMTS license auctions held across some major Western European countries.

In the mobile operator business the players have traditionally been mobile operators who have owned their own network and paid for their own licensed frequency spectrum, i.e. the traditional mobile network operators (MNO). Due to the opening of competition, and recently also the movement towards 3G, other types of business models have emerged. An example is the mobile virtual network operator (MVNO) business model. In this report mobile service operators (MSO) and MVNO's are for simplicity both categorized as MVNO's. An example of this kind of successful operator is the UK based Virgin Mobile.

The mobile communications business has been under steady growth during many years already. New potential markets have emerged and many are still to emerge. In e.g. China and Russia the overall subscriber growth has lately been very rapid and other markets, such as India will follow. In Europe the subscriber growth has already largely slowed down. According to the GSM Association, in February 2004 there were a total of 1024,3 million GSM subscribers in the world. In February 2003 this number was approximately 805,8 million. This means that in thirteen months the amount of GSM subscribers has risen by approximately 20 percent, and currently it seems that the amount will keep on growing even further. (GSM Association, 2004)

In-Stat/MDR forecasts that the worldwide wireless market will grow to more than 2.5 billion subscribers by 2009. Through 2007 GSM will see steady growth as it expands its worldwide footprint. However, from 2008 GSM growth will begin to decline as operators move subscribers to WCDMA. While GSM (including its packet based data technologies) will remain the dominant mobile technology throughout most of the forecast, CDMA standards (CDMA & WCDMA) will pass GSM in 2009 to claim the largest share of the market, in terms of number of subscribers. (In-Stat/MDR, 2004)

Japan and South Korea are currently clear leaders when it comes to mobile data, at least if SMS is left out of the figures. The European mobile service offerings have been largely about SMS. According to the mobile oriented market research company EMC's World Cellular Data Metrics –report, the Philippine mobile operators Smart and Globe are superior in the global comparison of the mobile data percentage of total revenues. These operators

get up to 35 percent of their revenues from mobile data, but mainly from SMS messages though. What's interesting according to the report is that both operators are now trying to raise their monthly ARPU's by promoting voice services instead of mobile data, which is clearly driving down the mobile data percentage. The report points out that the Philippines send on average 208 SMS messages per month. Compared to the Finnish market where during 2003 the users sent only 29 SMS messages per month (Mintc, 2004a), the Philippines can definitely be considered as heavy users of SMS messages. According to the report other operators with high mobile data percentages of total revenues are NTT DoCoMo with 25 percent, KDDI, Vodafone K.K., Vodafone Ireland, mmO2 England, mmO2 Ireland, T-Mobile Czech Republic with more than 20 percent, and mmO2 Germany, Vodafone Germany, T-Mobile Germany, Netcom Norway, Telenor Norway, and SingTel from Singapore with 17-20 percent. The Finnish mobile operators come far behind. (Tietoviikko, 2004)

In Europe mobile Internet services have been mainly initiated by handset and equipment makers. SMS can be considered a lucky accident, since it was merely an addition to the original GSM specification. Gradually, it gained popularity and instigated a wide set of complementary technologies. WAP balanced out the unplanned SMS success with an equally unplanned disappointment. A mobile Internet solution was of interest both to handset makers and even more so for the operators. The assumption was that an increase in data traffic can be expected. When these data intensive services failed to diffuse, some operators chose the Japanese strategy which is dominated by service based initiatives. The service based approach has worked well in Japan because of the influential position the mobile operator occupies. (Tee, 2003)

The current approaches going on in mobile Internet can be labeled as service based, platform based or protocol based. The two most notable examples of service based initiatives are NTT DoCoMo's i-Mode and Vodafone Live!. Two notable examples of platform based initiatives again are the Microsoft Smartphone platform and Symbian, with Nokia's Series 60 as the leading platform. Finally, there are also mobile Internet solutions based on protocols. One protocol that has been hoped to become successful is MMS. Despite these three approaches to mobile Internet it can still be regarded as a work in progress. (Tee, 2003)

## **2.2 Finland: Current Situation**

Finland's mobile phone market, together with the markets of the other Nordic countries, has been one of the most developed in the world. Today, in Finland, there are more mobile phones than fixed network subscriptions. In 1990's the Finnish mobile communications market was rather stable, with only Sonera (now TeliaSonera) and Radiolinja (now Elisa) competing for the subscribers.

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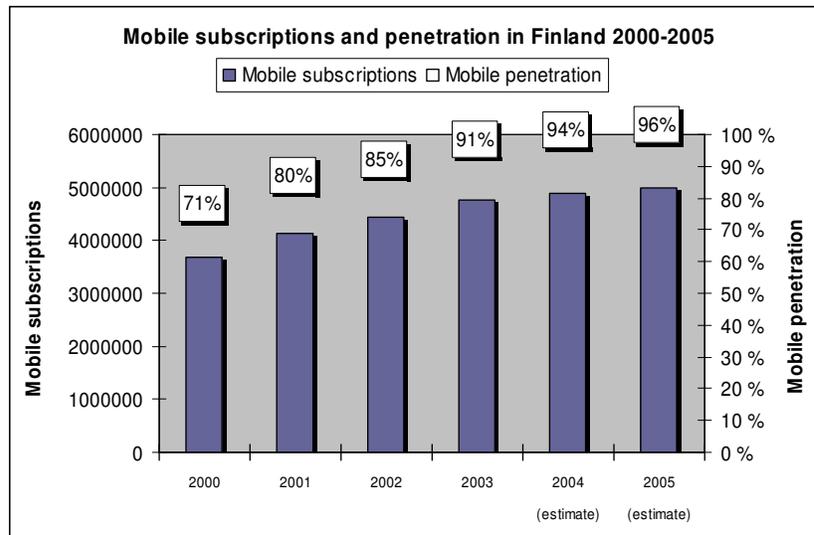
However, the market situation has changed rapidly during the past five years. Especially the mobile number portability (MNP) and the consequences of Telia's acquisition of Sonera have affected the market a lot. (Nieminen, 2003) The Finnish communications market has overall seen many changes during the last few years. The trend has been towards lighter regulation and more effective competition.

The MNO's need a license granted by the Ministry of Transport and Communications for their operations. Licenses for operation of national GSM networks are in Finland held by TeliaSonera, Elisa, and Finnet Networks. In addition to these three, Ålands Mobiltelefon has a GSM license for operation in the islands of Åland.

Finland was the first country in the world to grant licenses for UMTS mobile networks in March 1999. The licenses were granted through a beauty contest, not by auctioning as has been the case in many Western European countries. The UMTS networks are currently being built in Finland. Elisa opened their UMTS network for commercial use in November 2004 and TeliaSonera already opened theirs in the beginning of October the same year. The licenses for UMTS networks in Finland are currently held by TeliaSonera, Elisa, Finnet Networks, and Finnish 3G.

At the end of year 2002 there was approximately 87 mobile subscriptions per 100 inhabitants, i.e. approximately 4,5 million subscriptions in Finland (Mintc, 2004a). Currently the number of subscriptions is approximately 4,7 millions. The trend during the last years has been that the Finnish people use more and more mobile phones for voice telephony instead of using fixed-line telephony. But, the fixed market can still see growth because of new broadband Internet connections, mainly ADSL. The development of the mobile subscription penetration in Finland during the last four years and estimations for 2004 and 2005 can be seen in Figure 2 (Mintc, 2004a).

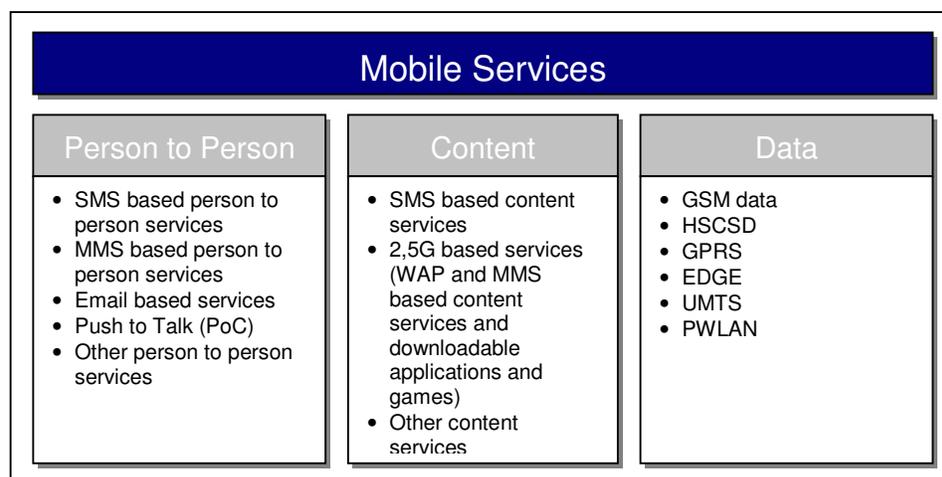
From Figure 2 it can clearly be seen that the penetration is moving towards saturation. Hence, the mobile operators in Finland are today fighting more and more for existing customers. This has led to a situation where the operators compete fiercely by lowering prices and by increasing the acquisition costs. This will evidently lead to lower margins for the operators. The new MVNO's and MNP have together had a huge impact at least on the reduced prices.



**Figure 2.** Mobile subscriptions and penetrations in Finland 2000-2005 (Mintc, 2004a).

The developments in mobile network technologies and mobile handsets have made it possible for new mobile services and business models to emerge. But, the speed in which these developments have emerged has also brought many challenges to life. The handsets are getting more complicated, life cycles are getting shorter and mobile service providers and developers have difficulties in anticipating the future.

The Finnish mobile services market is illustrated in Figure 3 (Mintc, 2004a). The mobile services can roughly be divided into: person to person services, content services, and data services. These services were thought to be possible only in 3G. However, these are already available in the current Finnish networks. But, the improvements in transfer capacity in 3G networks will improve these services further from the current GPRS networks, making the services more user-friendly and attractive. (Mintc, 2004a)



**Figure 3.** The mobile service market in Finland (Mintc, 2004a).

During 2003 the value of the Finnish mobile services market grew by 14 percent and was at approximately 226 million euros. Table 1 shows the value of the Finnish mobile services market between 2000 and 2003, and gives estimates for the years 2004 and 2005. From the table it can be seen that the growth has been fastest in data services, which grew by 73 percent. This has been possible because of the growth in GPRS enabled mobile handsets and the increased use of the GPRS service. (Mintc, 2004a)

**Table 1.** The value (in MEUR) of the Finnish mobile services market excluding VAT (Mintc, 2004a).

Services	2000	2001	2002	2003	2004 estimate	2005 estimate
<b>Person to person</b>	<b>121</b>	<b>144</b>	<b>136</b>	<b>148</b>	<b>154</b>	<b>154</b>
Change:		19%	-5%	9%	4%	0%
<b>Content</b>	<b>25</b>	<b>41</b>	<b>50</b>	<b>58</b>	<b>68</b>	<b>78</b>
Change:		66%	22%	16%	17%	15%
<b>Data</b>	<b>4</b>	<b>7</b>	<b>11</b>	<b>20</b>	<b>26</b>	<b>34</b>
Change:		81%	58%	73%	32%	31%
<b>Total</b>	<b>150</b>	<b>193</b>	<b>198</b>	<b>226</b>	<b>248</b>	<b>266</b>
Change:		29%	3%	14%	10%	7%

A radical change in the Finnish mobile communications market during the last months has been MNP. MNP has in Finland been required since July 2003. This means that a subscriber must be able to change his operator without changing his number. This has really changed the mobile communications market drastically. The Finnish marketplace for mobile services has suddenly become very attractive to new mobile service providers, also to foreign players (Kohonen, 2004). The amount of ported mobile phone numbers in Finland was between 25.07.2003 and 30.06.2004 was more than 993000 (Numpac, 2004).

In autumn 2000, a comprehensive reform of communications legislation was started in Finland. The need to reform the legislation arose from the general convergence trend. The purpose of the reform is to ensure that telecom operators and other companies in the communications market can operate in a modern legislative environment that takes the technological development in the market into account. (Mintc, 2004b)

The primary telecommunications legislation has evolved as illustrated in Table 2. (Mintc, 2002)

**Table 2.** *The evolution of the primary telecommunications legislation in Finland (Mintc, 2002).*

YEAR	LAW	DESCRIPTION
1886	Telephone Declaration	The Finnish senate was empowered to issue licenses for installation of telephone lines, no monopoly mentioned.
1919	Telegraph Law	Government monopoly to provide telegraph service.
1987	Telecommunications Act	Competing licenses possible, license granted based on political discretion. Initially Sonera had by law right to provide service, other operators needed a license.
1997	Telecommunications Market Act	Public mobile telecommunications needs a license, tendering mandatory, all other telecommunications is either subject to notification or fully liberalized, obligations to offer services and to lease lines to other operators, accounting separation of networks and services, meets EU directives, interface to competition legislation.
2002	Communications Market Act I	All communications networks (also broadcasting, except content) in the same law (convergence)
2003	Communications Market Act II	Meets the proposed new EU framework

After 1987 the legislation has been amended several times, almost annually. The above does not include these amendments. The Communications Market Act I includes the essential elements of convergence, including the policy of technology neutrality. (Mintc, 2002)

### **2.3 Finland: Future Projections**

How will the Finnish Mobile Communications Market look like in the future? It has already been stated that Finland is lagging behind other countries in mobile data. Will this trend continue? Finland has by no means been able to take advantage of the opportunities related to mobile data and mobile Internet. If Finland wants to, once again, be looked upon as a forerunner in mobile communications, especially as a forerunner in mobile data services and mobile Internet, something has to be done.

The UMTS auctions a few years back were harmful to the whole mobile communications industry. But, recently there have been some indications of recovery from many of the operators that were involved in the auctions.

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Finland was the first country in the world to issue UMTS licenses approximately five years ago. This was done by a beauty contest and the operators that managed to get the licenses got them for free. But why did it take so long to get a commercially available UMTS network in Finland?

There are of course many reasons, one of which is the handset vendors. Nokia has for a long time been the superior provider of mobile handsets to the Finnish consumers, but it has not yet been able to provide them with a decent 3G handset until very recently (November, 2004) when the Nokia 6630 started shipping. Until now Nokia has offered only two 3G models, one of which seems quite big and old with an exterior antenna (Nokia 6650) and one with a quite peculiar design (Nokia 7600). Another reason is of course that a 3G handset has been quite expensive, approximately 500 euros each. However, this situation will certainly change in the future when we will see more and more 3G handset models in Finland, also by other vendors.

But, the blame should not be placed solely on the handset manufacturers. Another reason is the Finnish MNO's, which have not been able, or willing, to open their UMTS networks commercially until recently. One reason, according to TeliaSonera, is that the Finnish 2G mobile networks and their services are so much ahead of other countries networks and services that a move from today's high quality networks to unreliably working UMTS technology would be a step backward. The move towards UMTS services should be done first when they work together as seamlessly as the current mobile networks and services do. (ITviikko, 2004)

Handset subsidization and bundling is currently a widely discussed issue in the mobile communications sector. Handsets subsidization is widely used on a global scale, but there are some exceptions, such as Finland, Italy and South Korea. For the Finnish mobile communications market handset subsidies might play a vital role in the launch of new UMTS services. This will be further discussed in chapter 6.

Due to fierce competition the prices for mobile services are getting cheaper. We also constantly see new players, e.g. MVNO's, who try to get their own share of the market. The pie is getting cut in more and more slices, but it is not growing. If to survive, the players need to move towards service differentiation. Costs need to be cut further, e.g. by moving customer service to the Internet.

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## Part II

### 3 BUSINESS GAMES AND MOB

The usage of active and problem-based learning has increased rapidly. In business schools, case based teaching has been extensively used. Computer based simulated virtual worlds are an environment where the active learning and problem-based approach can be naturally applied. These artificial environments can provide an invaluable dimension for learning and the demand for them is growing rapidly. Computer based business management simulations are one type of these virtual environments. (Töyli, 2001)

In the beginning of year 2003, a new professorship (Networking Business) started in the Networking Laboratory at TKK. During this time it was decided that a business game focusing on mobile operator business would be created. The motivation behind this decision was not only to create a business game about mobile operator business for teaching purposes, but also through the business game to be able to gain better insights into the mobile operator business as a whole, especially the Finnish one. One of the ideas was to find new research topics through the game, and then to model these into the game.

In this thesis the words *simulation* and *game* are used as synonyms. Business games can by no means exactly tell how the future will turn out. However, they can be used for analyzing business constraints, dependencies, and possible futures. Empirical evidence shows that business game sessions induce creative thinking and discussion about alternative evolution scenarios. Assuming players with the right expertise and attitude, the probability is high of identifying some unnecessary market bottlenecks. (Hämmäinen, 2003)

#### 3.1 Business Games

Business games promote the idea of learning by doing and they have become very popular and important teaching tools. The first widely known business simulation, Top Management Decision Simulation, was developed by the American Management Association in 1956 (Keys & Wolfe, 1990). In 1987, Faria estimated that about 8755 instructors in over 1900 four-year business schools used simulations/games in their course work (Faria, 1987). In 1998 Faria reported a slight increase in usage levels in all fields studied (Faria, 1998)

Kokko argues that the purpose of a business game is to provide students a summarizing overview of various subjects they have studied in the past. He suggests further that the key learning experience is seeing and applying many different theories in different fields and observing their linkages. The theories

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must be applied on somewhat superficial level in order to be able to give the summarizing learning experience with wide scope. (Kokko, 2004)

The following two citations give in the author's opinion a good and short explanation of what a business game should be all about (purpose) and also a description about the validity of a business game:

*"The purpose of a teaching simulation is to convey experimental lessons transferable to the real world"* (Lane, 1995)

*"The game [simulation] is valid to the degree that the learning objectives are achieved by the participants"* (Peters et al., 1998)

More about validity of business games will be presented in the chapter Reliability and Validity Analysis.

It is important to remember that a business game can not exactly tell how the future will turn out. But, a well implemented business game can most definitely be used to:

- Analyze business constraints and dependencies;
- See what a possible future could look like;
- Help to gain better understanding of businesses and management;
- Improve teamwork;
- Be fun.

### **3.2 The Mobile Operator Business Game**

This subchapter will not go into details about MOB, instead the timeline of the MOB project, the situation in the beginning of this research, the current situation, some usability issues, and the implementations that are needed will be presented. Details about MOB can be found from the player instructions in Appendix 1 and Kokko (Kokko, 2004).

Some facts about MOB:

- The Mobile Operator Business Game is a domain specific business game specifically related to the mobile operator business environment;
- Focus on new mobile data services;
- An early elementary prototype developed by Kokko;
- Goal: A teaching tool.

### 3.2.1 Timeline of the MOB project

The timeline of the MOB project is as follows:

- Beginning of 2003 – September 2004;
  - During this time the first model, an early elementary prototype, was built.
- January 2004:
  - Kokko finished his Master's Thesis *Mobile Operator Business Game*. (Kokko, 2004).
- October 2003:
  - Responsibility of the work given to the author of this Thesis.
- Fall 2003:
  - The first major test was conducted during the course *S-38.042 Seminar on Mobile Operator Strategies and Games*;
  - The testing was made by students participating to the course;
  - During the course two other business games (Simobiz, 2004 and Cesim, 2004) related to mobile communications was played (see Kokko, 2004). This was considered as good benchmarking;
  - The test sessions gave valuable feedback for further work.
- End of 2003 – April 2004:
  - Second stage of development (improvements in usability and functionality, some new features, documentation etc.);
  - A player instructions manual was written based on the work by Kokko;
  - User interface was renewed, making MOB much easier to use;
  - Some major and minor flaws were corrected;
  - Financing and the income statement were improved, and a balance sheet added making the playing of the game more realistic.
- April 2004:
  - The next major tests were conducted during the course *S-38.041 Networking Business*;
  - The testing was made by students participating to the course and the participation was voluntary;

- Before the MOB sessions the participants were able to learn about networking business and about MOB during lectures (More about the experiences from the sessions in the Experiences chapter);
- By March 2005:
  - This Master's Thesis.

### **3.2.2 Situation in the Beginning of this Research: The First Elementary Prototype**

The first elementary prototype of MOB was built starting at the beginning of year 2003 to early fall of year 2003. During this time the planning of the initial models behind MOB was made and after that also the initial implementation. Very little concern was put on the actual user interface and usability of MOB, the idea was to get a working prototype up and running as fast as possible. Information about this stage of development can be found from Kokko (Kokko, 2004).

### **3.2.3 Usability, User-friendliness and the Current Situation of MOB**

During the first elementary prototype stage usability and user-friendliness of MOB was a big issue. Though the models and the actual game seemed to work quite well during the session held on the course *S-38.042 Seminar on Mobile Operator Strategies and Games*, the feedback that was gotten on MOB was not as good as it could have been. However, the feedback was despite that still very valuable. Much of the feedback was actually about the actual usability of the game.

This was the reason why at the next stage of development of MOB we started by making the user interface of the game more user-friendly, i.e. more playable. All the decisions sheets, or windows, in MOB got a face lift and the goal was to make all the decision windows as simple as possible.

Here are some of the improvements that were made:

- The decision windows were made smaller, so that neither horizontal nor vertical scrolling would be needed when making the decisions;
- The colors were made more "friendly to the players' eyes", more balanced;
- Buttons for moving from one decision window to another were placed in the upper left corner of every decision window;
- Decisions of previous seasons were included into all decision windows, making it easier for the player to make decisions for the next season;
- A thorough player instructions manual was made available to the players;

- The players of MOB were now able to print some important numbers that are needed to make good decisions;
- A working what-if mechanism to easily “fine tune” your decision making;
- The financing decisions were improved, now also including a cash flow statement;
- The income statement was improved and a balance sheet was also added making it easier to make good decisions.

These improvements were tested later during the course *S-38.041 Networking Business* and feedback from these sessions can be found in the Experiences chapter. Figure 4 shows The Offers for Consumers: Voice Services decision window in MOB after the improvements to the user interface.

Main	Offers for Consumers	Offers for Corporations	Marketing	Research and Development		
Network Maintenance	Purchasing	Human Resources	Finance & Cash Flow Statement	Income Statement & Balance Sheet		
<b>Voice Services</b>	Data Services	Messaging Services				
<b>Offers for Consumers</b>						
<b>Postpaid subscription</b>			<b>Prepaid subscription</b>			
		<b>Season 6</b>	<b>Season 5</b>			
Nr. of postpaid subs			807 065	Nr. of prepaid subs	44 817	
Opening charge:			0,00	Opening charge:	1,00	
Monthly charge:			2,00			
Calls (€/min):	07:00-17:00		0,16	Calls (€/min):	07:00-17:00	0,20
	Other		0,11		Other	0,15
Average min/subs/month: 07:00-17:01			71,44	Average min/subs/month: 07:00-17:01		65,33
Average min/subs/month: other			80,56	Average min/subs/month: other		73,67
Total average min/subs/month			152,00	Total average min/subs/month		139,00
Estimated nr. of postpaid subs			700 000	Estimated nr. of prepaid subs		38 000
Estimated average min/subs/month: 07:00-17:00			70,00	Estimated average min/subs/month: 07:00-17:00		64,00
Estimated average min/subs/month: other			82,00	Estimated average min/subs/month: other		76,00
Revenues (k€)			215 893	Revenues (k€)		13 508
Estimated revenues (k€)		0	187 263	Estimated revenues (k€)		0
						10 921

**Figure 4.** The Offers for Consumers: Voice services decision window in MOB.

The reason why decisions of previous seasons were included into all decision windows was that the decision making became much easier for the next season. As can be seen from Figure 4, it is now easier to adjust the values for the next season according to the results from the previous season.

A working what-if mechanism was implemented to make the decision making easier. Because of the what-if mechanism the players of MOB can now “fine tune” their decisions. The what-if mechanism also forces the players to carefully analyze their decisions. The players can not make “ridiculous” decisions any more because the what-if mechanism forces the players to go through every single decision and how it affects the whole situation.

To learn financing issues is not the main concern of MOB. However, financing is an important part of every business, not only the mobile operator one. Hence, the financing part of MOB had to be improved drastically from the first prototype of the game. The financing window can be seen in Figure 5 and it includes a simple cash flow statement.

Financing & Cash Flow Statement	
<b>Payments (k€)</b>	
Long term dept last year	200 000
Short term dept last year	26 000
Interest rate on long term debt:	0,040
Interest rate on short term debt:	0,080
Increase long term debt:	0
Decrease long term debt:	200 000
Long term dept next year	0
<b>Cash flow statement (k€)</b>	
Cash flows from operating activities	
EBITDA	-33 472
Financing expenses	10 080
Taxes	0
<b>Net cash provided by operating activities (A)</b>	<b>-43 552</b>
Cash flows from investing activities	
Investments	0
<b>Net cash used in investing activities (B)</b>	<b>0</b>
Cash flows from financing activities	
Change in long term dept	-200 000
Change in short term dept	-26 000
<b>Net cash used for financing activities (C)</b>	<b>-226 000</b>
<b>Net increase (decrease) in cash (A-B+C)</b>	<b>-269 552</b>
Cash at beginning of year	-84 596
<b>Cash at end of year</b>	<b>-354 148</b>

Figure 5. The financing and cash flow statement decision window in MOB.

The income statement from the first prototype version of MOB needed a radical improvement. The income statement and can be seen in Figure 6.

Budgeted Income Statement	Income Statements: Previous Years	Budgeted Balance Sheet	Balance Sheets: Previous Years										
Income Statements: Previous Years													
Income statement (k€)		Season: 0 1 2 3 4 5 6 7 8 9											
<b>Revenues</b>													
Consumer postpaid voice revenues	215 005	162 112	202 344	199 623	205 499	172 997							
Consumer prepaid voice revenues	13 495	16 790	17 585	15 653	15 691	10 535							
Consumer data revenues	1 170	901	2 200	35 875	46 417	70 666							
Consumer SMS revenues	39 984	33 956	33 565	29 076	24 340	16 299							
Consumer MMS revenues	198	838	4 401	10 267	23 505	32 347							
Corporate voice revenues	141 750	138 231	143 762	157 565	158 547	129 392							
Corporate data revenues	827	3 552	4 382	8 543	17 110	30 590							
<b>Total</b>	<b>412 429</b>	<b>356 379</b>	<b>408 239</b>	<b>456 603</b>	<b>491 110</b>	<b>462 826</b>							
<b>Costs</b>													
Marketing expenses	80 000	60 000	120 000	110 000	150 000	150 000							
Maintenance expenses	1 700	1 900	2 500	3 400	5 600	5 600							
Purchasing expenses	168 250	84 537	84 537	84 537	84 537	84 537							
Corporate customer acquisition expenses	6 500	6 500	8 000	8 500	8 500	14 000							
Corporate customer relations expenses	1 630	1 700	1 700	2 000	2 000	2 000							
Personnel expenses	22 932	29 810	42 437	41 952	42 583	35 102							
R&D expenses	105 000	105 000	115 000	60 000	25 000	5 000							
<b>Total</b>	<b>217 762</b>	<b>204 910</b>	<b>289 637</b>	<b>225 852</b>	<b>233 683</b>	<b>211 702</b>							
Earnings before interest, taxes, and depreciation (EBITDA)	194 667	151 468	118 602	230 751	257 427	251 124							
Depreciation from fixed assets	111 834	112 109	101 690	94 614	96 123	100 586							
Earnings before interest and taxes (EBIT)	82 833	39 360	16 911	136 137	161 305	150 537							
Financial expenses	28 000	10 080	10 080	10 080	10 080	10 080							
Taxes (29%)	15 902	8 491	1 981	36 557	43 855	40 733							
<b>Profit</b>	<b>38 931</b>	<b>20 789</b>	<b>4 850</b>	<b>89 504</b>	<b>107 370</b>	<b>99 725</b>							

Figure 6. The improved income statement in MOB.

Also a balance sheet had to be added, making it easier to make good decisions. The balance sheet can be seen in Figure 7.

Budgeted Income Statement	Income Statements: Previous Years	Budgeted Balance Sheet	Balance Sheets: Previous Years											
<b>Balance Sheets: Previous Years</b>														
Budgeted balance sheet (k€)				Season:	0	1	2	3	4	5	6	7	8	9
<b>Assets</b>														
Fixed assets	1 118 338	1 091 042	1 066 475	1 044 365	1 024 466	1 006 557								
Cash and cash equivalents	70 593	180 917	253 889	137 026	341	-84 596								
<b>Total</b>	<b>1 188 931</b>	<b>1 209 720</b>	<b>1 214 570</b>	<b>1 054 071</b>	<b>887 440</b>	<b>787 165</b>								
<b>Liabilities &amp; shareholders' equity</b>														
<b>Equity</b>														
Share capital	500 000	500 000	500 000	500 000	500 000	500 000								
Previous years profits	-300 000	-261 069	-240 280	-235 430	-145 929	-38 560								
Profits for this year	38 931	20 789	4 850	89 501	107 370	99 725								
<b>Total shareholders' equity</b>	<b>238 931</b>	<b>259 720</b>	<b>264 570</b>	<b>354 071</b>	<b>461 440</b>	<b>561 165</b>								
<b>Liabilities</b>														
Long term dept	950 000	950 000	950 000	700 000	400 000	200 000								
Short term dept	0	0	0	0	26 000	26 000								
<b>Total liabilities</b>	<b>950 000</b>	<b>950 000</b>	<b>950 000</b>	<b>700 000</b>	<b>426 000</b>	<b>226 000</b>								
<b>Total</b>	<b>1 188 931</b>	<b>1 209 720</b>	<b>1 214 570</b>	<b>1 054 071</b>	<b>887 440</b>	<b>787 165</b>								

**Figure 7.** The balance sheet in MOB.

The income statement and balance sheet are not the main focus of MOB, but for the players to be able to make good decisions they are definitely also needed. The income statement and the balance sheet together show the current financial situation of the players' teams in MOB. They also show the future projections making it possible, or at least easier, to define a winner for the game. There is also a budgeted income statement and a budgeted balance sheet for the next season in MOB. These two help the players of MOB in the what-if analysis.

### 3.2.4 The Next Step in MOB Development

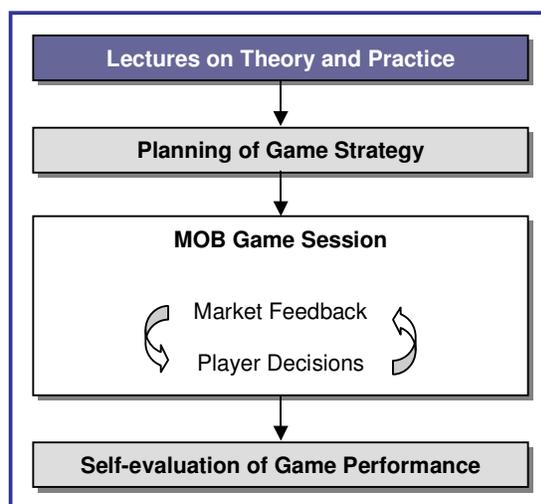
The next step in MOB development is to implement the issues that are described in Part III of this report. These developments to MOB are needed to make the whole model of the mobile operator business more realistic, taking some very important aspects of the business into account. These are developments are:

1. The mobile content business;
2. The roaming business;
3. The MVNO business;
4. The handset business.

## 4 EXPERIENCES

This chapter reviews the experiences and evaluates the feedback that was given by participants to three separate MOB sessions. The sessions were arranged in May 2004 as part of the graduate course *S-38.041 Networking Business* at TKK. Before the game sessions, the students participated in lectures covering the essentials of networking business, with focus on mobile markets. A couple of days before the game sessions each team of students had to prepare and report their business strategy to the teachers. Each game session took roughly one working day including 5-7 decision rounds, or market seasons. During each session, 3-4 teams of 2-4 students sitting in the same computer classroom competed against each other in the same MOB market space. At the end of the session, the students filled in a feedback questionnaire on individual basis.

Within a week after the game sessions students evaluated and reported their own game performance. Our training process (see Figure 8) was still experimental and we hoped to get relevant player feedback also on alternative learning arrangements.



**Figure 8.** The structure of MOB training process.

The level of knowledge of the MOB participants varied quite much. The 36 students that participated to the MOB sessions consisted of both graduate and post graduate students. Some had only basic knowledge of the mobile operator business, but on the other hand some were more experienced with work experience from the field.

### 4.1 Experiences: Training Process

#### 4.1.1 Lecture

Before the game sessions, the students had already participated in lectures covering issues needed in the actual game sessions. One of these lectures

included an introduction to the actual mobile operator business game. The lecture concentrated on giving basic information about the world of business games, important things to keep in mind, and some explanations about the actual decision windows in MOB. The lecture was not obligatory but was recommended warmly for those who were going to participate in the game.

#### 4.1.2 Planning the Game Strategy

Before attending to the game sessions, the students had to do a preliminary exercise in teams. The preliminary exercise can be found in Appendix 3. The main task of the preliminary exercise was to formulate an overall business strategy over how to succeed in the game. The participants had to define the game strategy based on what they had learned in earlier studies and during the lectures, but also based on their knowledge of the real world. The students were supposed to use the documentation that was available. This consisted of player instructions and a scenario description. The scenario description is a short description of the actual scenario of the market in MOB and it can be found in the actual player instruction manual in Appendix 1.

During the game session it was apparent that because of thorough planning, the students were able to fairly fast start making their own decisions. Because of the limited time we had, approximately 7 hours (including a lunch break), this was essential.

Table 3 illustrates what the students thought about the usefulness of the preliminary exercise and the game strategy planning that was involved. This data suggests that the preliminary exercise is needed. It helps the students to get a good picture of what it's all about and to start playing without too much delay.

**Table 3.** Feedback about the preliminary exercise.

	I totally agree	I agree	I agree/ I don't agree	I don't agree	I totally don't agree	I can't say/ no comments
The preliminary exercise added value to the learning of the game as a whole	14	16	6	1		

Here are a few comments from the students about the preliminary exercise:

- *The preliminary exercise is essential for the game. There is no point in just going to the session and play if one has not thought about the strategy beforehand.*
- *It was advantageous to follow up and analyze all actions during the whole game, not just the meaning of your own actions.*

- *Playing without planning and without creating our strategy would not have given the experience that we got with carefully planned strategy.*

#### **4.1.3 The Game Session**

Each game session took roughly one working day including 5-7 decision rounds, or market seasons. It was clear that the 7 hours of time we had was too short a timeframe for the students to make thorough decisions, and perhaps a two day session would be preferred. This might of course change in the future as MOB will be improved, as goes for the training process as a whole.

During the game session, 3-4 teams (mobile operators) of 2-4 students sitting in the same computer classroom competed against each other in the same MOB market space. One team had to manage with only 2 members of the team as an absence occurred. However, that the team size of 3-4 students seems to be quite optimal. Less than three students result in a situation where discussion in the team would become limited, more than four students would again result in a situation where all the team members wouldn't be able to fit around one computer screen.

At the end of the session, the students filled in a feedback questionnaire on individual basis. This gave us the opportunity to get to know how the participants experienced this type of teaching and what their opinions were about different aspects of the game, such as usability, playability, complexity, and substance scope but also about opinions for further development etc. The feedback questionnaire can be found in Appendix 2.

#### **4.1.4 Self-evaluation**

After the actual game session the student had to write an individual final report. The main task of the final report was to analyze how the students' team succeeded in the game. Another task was to analyze how the teams' actions differed from that of the plans that the team had done in the preliminary exercise.

Table 4 illustrates what the students thought about the usefulness of the final report. As for the preliminary exercise, it's also here clear that the final report is needed. The final report can be found in Appendix 4. The final report adds to the learning experience and forces the students to think about what they have done, e.g.: what was done wrong, what was done right, and what could have been done in a different way.

**Table 4.** Feedback about the final report.

	I totally agree	I agree	I agree/ I don't agree	I don't agree	I totally don't agree	I can't say/ no comments
The final report added value to the learning of the game as a whole	3	16	10	8		

Here are sample comments from the students about the final report:

- *I think it's very important to review your own decisions afterwards. One needs to go through the decisions and analyze them, especially if one has not made it very well during the game.*
- *The final report as a whole made me repeat the game in my mind and to think about what we did and why.*
- *It is important to learn from your own mistakes.*

Some of the students that did not agree upon that the final report added value to the learning of the game as a whole thought so because in their opinion they had already gone through the actual game session directly afterwards. This indicates that the final report should be developed further in some way.

## 4.2 Experiences: Feedback Questionnaire

In this section the feedback that was given by the students at the end of the sessions will be gone through. Here will be described how the participants experienced this type of teaching and what their opinions were about different aspects of the game, such as usability, playability, complexity, and substance scope but also about opinions for further development etc.

Here are sample comments about student learning during the MOB sessions and also what they thought about this kind of teaching compared to normal lecturing?

- *It was fun and useful;*
- *A good complement;*
- *Learning can also be fun;*
- *Fun team work... a lot of fun! Good way!*
- *MOB session was very interesting and educational. If the lectures and MOB sessions were combined, one would get even more out of the sessions/ game.*
- *This kind of teaching is very efficient compared to lecturing;*
- *I found out that implementing predefined strategies is very important;*

- *Learning by doing is much more effective;*
- *This was a nice way to complement the studies in a class room;*
- *Definitely better than lectures. Personally I never learn anything during lectures, but today I did. MOB gave a good view about all the things that a successful operator has to consider.*

Tables 5-9 show some of the feedback that was given after each of the played sessions.

Table 5 shows how the players of MOB felt about the goals of MOB, both the presentation of the goals and the achievement of the presented goals.

**Table 5.** *Feedback about the goals of MOB.*

	I totally agree	I agree	I agree/ I don't agree	I don't agree	I totally don't agree	I can't say/ no comments
<b>The goal for MOB was clearly presented</b>	9	20	6	1		
<b>The presented goals were achieved</b>	3	24	8	1		
<b>The grade (4-10) for the presentation of the goals</b>	<b>Average: 8,1</b>					

The goal for MOB was according to the feedback clearly presented. This indicates that while preparing for the MOB sessions the information about what MOB is all about had been clearly presented. The same goes for achieving the presented goals. A majority of students largely felt that the presented goals were achieved. The average grade (4-10) for the presentation of the goals was 8,1.

Table 6 shows the feedback about the success factors related to the actual game. From this table you can find information about what was needed or what helped in succeeding in the game. The different strategic approaches that were used by the teams during the three held sessions were in many ways quite different. It was clear that different kinds of strategic approaches were possible (e.g. cost leadership, differentiation and focus). However, most of the teams chose more than one of the different strategic approaches.

According to the feedback, a strategic approach was needed to succeed in the game. This indicates that the preliminary exercise was needed as a starting point to the game. The feedback also shows that a systematic and well planned approach helps in succeeding. This again indicates that it is possible to make systematic and well planned actions in MOB.

The feedback shows that it helps to have good knowledge about the mobile operator business. However, many also feel that this is not the case. This might be an indication that the mobile operator business is not that different

from any other businesses. More likely this is an indication that the usability and the simplicity of the game is at a fairly good level though.

**Table 6.** *The success factors according to the students.*

	I totally agree	I agree	I agree/ I don't agree	I don't agree	I totally don't agree	I can't say/ no comments
<b>A strategic approach was needed to succeed in the game</b>	11	20	4	1		
<b>A systematic and well planned approach helped in succeeding</b>	11	19	3	3		
<b>Good knowledge about the mobile operator business helped in succeeding</b>	8	15	11	1	1	
<b>The success in the game was only about luck</b>		2	7	17	10	

What was very positive, at least from the author's point of view, was that the majority of participants to the MOB sessions thought that the success in the game was not only about luck. Luck is of course a part of any game, but at least according to the feedback not that relevant in the playing of MOB.

Table 7 shows the feedback about the complexity in MOB and also about how realistic the game is. We can again see that participant's impressions about MOB were quite positive. A majority felt that the game seemed realistic and this was also the case about the complexity of MOB. These were again good indications that the usability and user-friendliness of MOB is already on a good level. However, MOB was still considered demanding enough.

The participants also thought that the actions of the competitors had been reasonably enough taken into account in MOB. This is a clear indication that one team's actions really affect the other teams' performance. According to the feedback the world in MOB did not fully function according to the real world. At least there was some disagreement about that.

**Table 7.** *Feedback about the complexity in MOB and how realistic it is.*

	I totally agree	I agree	I agree/ I don't agree	I don't agree	I totally don't agree	I can't say/ no comments
<b>MOB seemed realistic</b>	2	21	11	2		
<b>The actions of the competitors had been, reasonably enough, taken into account</b>	2	26	5			3
<b>MOB was too complicated</b>		1	6	16	13	
<b>The world in MOB functioned according to what you have learned</b>	3	14	15	1		3
<b>MOB was demanding</b>	1	16	13	4	2	

Table 8 is about the substance scope of MOB. The first item in this table is also closely related to usability and user-friendliness of MOB. According to the feedback the participants thought there were not too many decision items in MOB.

The next two items in Table 8 show that there is still a need for some more focus on future services, but what comes to the modeled value chain in MOB, the feedback indicates that it is already sufficiently covered.

**Table 8.** Feedback about the substance scope.

	I totally agree	I agree	I agree/ I don't agree	I don't agree	I totally don't agree	I can't say/ no comments
<b>There are too many decision items in MOB</b>	1	1	5	25	4	
<b>More focus should be put on future services</b>	2	12	12	9		1
<b>The value chain is sufficiently covered in MOB</b>	3	9	13	11		3

The last table (Table 9) in this section is about general things in MOB. This table is also concerned with usability and playability, and with learning. Learning is a wide concept and it should also be treated accordingly.

**Table 9.** Generally about MOB.

	I totally agree	I agree	I agree/ I don't agree	I don't agree	I totally don't agree	I can't say/ no comments
<b>MOB was easy to use</b>	8	22	3	2	1	
<b>MOB gave enough information for making decisions</b>	1	17	10	7	1	
<b>During the MOB session, the players got enough feedback to be able to play the game</b>	3	26	3	2		2
<b>The grade for the teaching (4-10)</b>	<b>Average: 8,4</b>					
<b>The grade for MOB (4-10)</b>	<b>Average: 8,6</b>					
<b>The grade for your own learning (4-10)</b>	<b>Average: 7,9</b>					

The first three items in the table are about usability issues. These again show that the usability of MOB is currently at a fairly good level. The feedback also indicates that MOB gives enough information for making decisions. They also thought that during the MOB sessions, the players got enough feedback to be able to play the game.

The grades (4-10) for both the teaching and the learning averages at about 8 and can be considered as fairly good, even excellent considering that this was the first major test for MOB. The grade (4-10) for MOB as a whole is even higher at an average of 8,6.

As a conclusion, MOB has largely reached those goals that were set in the beginning of its development. MOB seems to be able to convey many important lessons that would be hard to give via traditional teaching and lecturing. It also motivates the players to really learn those “tools” that they might have undervalued before (see also Töyli et al., 2004).

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## Part III

### 5 MOBILE CONTENT BUSINESS

The expectations for the mobile content business have been high under the last few years. Developments in technologies have made new services possible and speculations around these have been quite active. Mobile content is expected to generate new business opportunities, both for operators and other players in this market space. Especially during the years 1999-2001 the expectations were high. However, during the years 2002-2003 these expectations became more realistic. Disappointments in the mobile content business are due to the high expectations set in the years 1999-2001. But, at the same time the market for mobile content has steadily been growing. One just needs to remember that the mobile content business is still very young. (Mintc, 2004a)

New mobile services are emerging into the market and the role of appropriate content is becoming increasingly important. As data speed goes up prices of plain transmission services decrease and some value of mobile services is moving into the content market. The amount of players in the mobile content field has increased, but the interconnections between parties have not yet been clearly defined. The most significant questions in interdependencies between mobile content players include revenue sharing, charging structures, attractive service entities and interaction with the customers. (Kiiski & Kiiski, 2003)

#### 5.1 *Mobile Content*

The mobile handset can be used for purchasing different kinds of content. When you purchase the content the payment can be handled in different ways. When the payment is organized through the mobile network, the payment is usually called a micro-payment. The micro-payment space is where the mobile operator is in a strong position. They have the billing and charging mechanisms and also know how to use them.

The mobile content business is still in an unstable phase because of fast evolution. The mobile operators need to understand that mobile content is a volume business and volume will be difficult to achieve within a walled garden. They are going to have to let users loose into the wider mobile web in order to drive up the number of transactions. And, as far as content goes, they are going to have to revisit the complex issue of revenue sharing. (A Week in Wireless, 2004)

### 5.1.1 Content Types

Mobile content can roughly be divided into physical content and digital content. These two types of content will be described next.

#### **Physical Content**

Physical content is, as the name suggests, a physical good or service. It can for example be a book, a candy bar from a vending machine, or perhaps even a car wash. It can practically be anything that isn't in all digital form. The problem with physical content is the complexity of physical processes and the need to adapt them for e-payments.

End-users are also usually afraid of large bills. If you add e.g. the price of a book to the end-user's phone bill, the user might stop, or at least lower, his or her usage of other mobile communications services. A book can for example be priced at as much as 60 euros. The mobile end-user wants to be in control of his phone bill at all times.

#### **Digital Content**

The term digital content refers to content or services that are replicated and delivered in digital form. Ring tones, logos, and EMS (Enhanced Messaging Service) messages were the first mobile digital services that were able to generate real income for the mobile operators and for the mobile service and content providers. Mobile information services and content, like news, financial information, weather forecasts, and traffic notifications are other possibilities for the parties in the mobile content field to generate additional value for the mobile end users. (Kiiski & Kiiski, 2003)

Other important digital content opportunities are in the gaming and music fields. Also infotainment can be considered as a big value adding opportunity, as for location based services. But, there are yet many problems in these fields, Digital Rights Management (DRM) to name one.

### 5.1.2 Channels to Access Mobile Content

#### **SMSC**

The first mobile content was available through the use of SMS. SMS has become a key service for mobile operators, generating tremendous usage, particularly among the youth market segment. Examples of services or content offered through the Short Message Service Centers (SMSC) are operator logos, ring tones, and EMS.

SMS was introduced as a simple voicemail notification service and has since that it has evolved to become one of the most successful media for person to person communication and value added services. The SMSC became the heart of mobile operators' network infrastructure as they facilitated the sending and receiving of millions of messages. (Netsize, 2003)

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SMS is a so called store-and-forward system. SMS messages are sent to the SMSC from e.g. a mobile phone. By interacting with the mobile network the SMSC then tries to determine the availability of a user and the user's location to receive a short message.

SMS has a very simplified and straightforward user interface where the message content is used as an input for the service. A typical transaction is originated by a customer who sends an action command into a predefined short message number and then receives the outcome of the command from the service. (Kiiski & Kiiski, 2003)

### **MMSC**

MMS is a mobile messaging standard defined by the Third Generation Partnership Program (3GPP). From an end user perspective, it enables the addition of multimedia features, such as graphics, photos, sounds, rich text and interactive applications, to the popular SMS text messaging service. MMS opens up the potential to bring radical new services to the end user. MMS can carry attractively presented news up-dates, music, games, and a variety of other entertainment applications, including games. (Juniper Research, 2002)

The idea behind the Multimedia Messaging Service Center (MMSC) based content is the same as in SMSC case, but the advantage of a MMS message is that one message can contain higher quality and richer content. MMS services can benefit from the fact that the user interface is like in SMS service, a user interface that the end users are used with. (Kiiski & Kiiski, 2003)

The MMSC is responsible for managing and monitoring MMS traffic, and for providing the data needed for charging and billing. The main functions of the MMSC are to: (Ralph & Graham, 2003)

- Receive MMS messages and transmit them to their destinations;
- Receive messages for MMS users from other services, such as email;
- Convert the content of a message, where supported, to suit the capabilities of the destination device;
- Generate the data records needed to bill subscribers for service usage and content.

### **WAP Gateway**

Wireless Application Protocol (WAP) gives users access to Internet or World Wide Web (WWW) services through handheld devices. The WAP Gateway provides a solution to the growing demand for mobile services across the world. WAP Gateways act as the bridge between the mobile world and the Internet.

The latest evolution of WAP (WAP 2.0) was developed to overcome some of the inherent problems in WAP technology. The WAP standards can be

downloaded from the web (Open Mobile Alliance (OMA), <http://www.openmobilealliance.org>). WAP 2.0 is roughly the sum of WAP 1.x, i-mode, Internet protocols, and many mobility specific enhancements. WAP 2.0 continues to support WAP 1.x protocols, but additionally integrates IP, TCP (wireless profile), and HTTP (wireless profile). The WAP 2.0 browser also supports XHTML (with mobile profile). (Schiller, 2003)

WAP has not quite yet shown its full potential in mobile commerce. A new area that might increase the usage of WAP gateway billing service is the Java MIDP (Mobile Information Device Profile) execution environment in terminal equipment. The WAP gateway offers the most suitable chargeable way to get the software package into the mobile terminal. (Kiiski & Kiiski, 2003)

Different kind of Push WAP, (new feature in WAP 2.0) services might also be able to create future growth and profit opportunities. Push WAP is one of the most exiting features of WAP 2.0 specification. It extends hugely popular SMS messaging and offers an easy interface for receiving real-time alerts and notifications. Real-time email notifications, auction alerts, and mobile chat are just some of the services suited to Push WAP. (Paavilainen, 2002)

## **5.2 Pricing and Charging of Mobile Content**

Successful pricing and charging is of great importance for the mobile operator's that participate in the mobile content business. There are many problems that need to be solved and, if they are solved in a well thought manner, the mobile operator is going to be in a good competitive position towards other operators.

Pricing of digital content is problematic because the price per product can't be defined based on the production costs. The development of the first content product can cause major part of the cost whereas the production of similar products is free or can be produced with low cost. The price of content can be based on different issues - there is no explicit definition, what is the modest price for certain content. Physical items like books purchased via mobile Internet can easily be priced per product, but pricing immaterial information is more difficult. (Kiiski & Kiiski, 2003)

Pricing can be based on: (Kivisaari & Luukkainen, 2003)

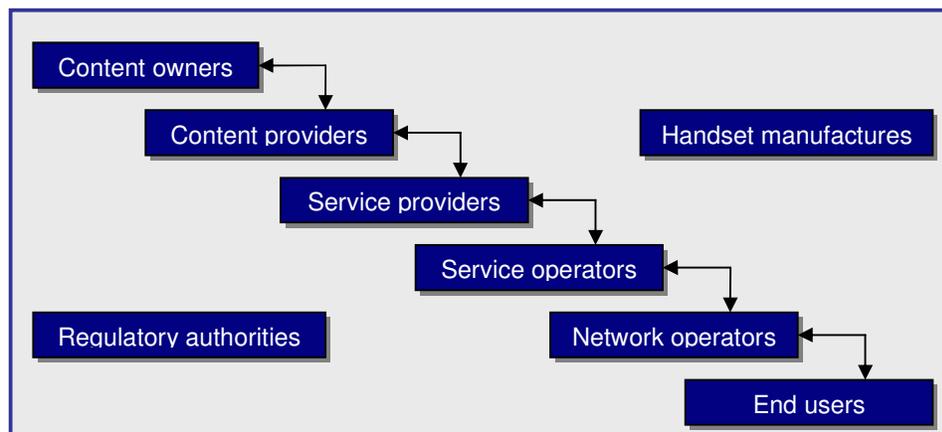
- Customers willingness to pay for a certain service;
- Service differentiation to provide different quality levels;
- Content service bundling into attractive entities;
- Price discrimination: different price for different customers.

Charging is also a problematic issue. The major part of charging of mobile content services is based on the model where the mobile content provider and the mobile service provider have to have a mutual agreement that a certain

service is offered for service operator's customers. When this agreement is made the user is able to access the content and the service operator takes care that the customer is charged appropriately. The service operator then pays the content provider for the content. (Kiiski & Kiiski, 2003)

### 5.3 Players in the Mobile Content Business

The mobile services and content field is fragmented and dynamic, which makes it difficult to model. Hence, cooperation is of great importance. Service creation can be accomplished at several stages. These stages create a value chain that can be modeled according to Figure 9 (Hämeen-Anttila, 2002).



**Figure 9.** The value chain of the mobile content business (Hämeen-Anttila, 2002).

Some of the stages in the value chain presented above can belong to the same actor. For example the content owner and the content provider can be the same player, or a player can perhaps act as both the service provider and the service operator.

### 5.4 The Finnish Mobile Content Market

A very important question for the mobile content business is how the free content of the Internet will affect the mobile content market and its value as a whole. This issue is becoming more and more important, while the advanced mobile handsets with web browsing capabilities are getting more common. In general, the preferred delivery method seems to be browsing, rather than downloading or streaming, but this depends on the content being accessed (Nokia, 2004).

A clear trend on the Finnish mobile content market is currently the shift from SMS based content services to 2,5G content services. This can be seen from Table 10, which shows the value of the Finnish mobile content market, divided in SMS based and 2,5G based content services. (Mintc, 2004a)

**Table 10.** The value of the Finnish mobile content market, divided in SMS based and 2,5G based content services (MEUR, VAT excluded). (Mintc, 2004a)

	2000	2001	2002	2003	2004 estimate	2005 estimate
<b>SMS based content services</b>	<b>25</b>	<b>41</b>	<b>49</b>	<b>45</b>	<b>38</b>	<b>35</b>
Change:		66%	20%	-7%	-16%	-9%
<b>2,5G content services</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>12</b>	<b>30</b>	<b>43</b>
Change:				1152%	140%	46%
<b>Total</b>	<b>25</b>	<b>41</b>	<b>50</b>	<b>58</b>	<b>68</b>	<b>78</b>
Change:		66%	22%	16%	17%	15%

The growth in 2,5G content services was remarkable during the year 2003, however, this was a result from the fact that these services were almost non-existent a year earlier. But, despite the smaller value of the SMS based content services the total value will still in the years 2004-2005 experience growth.

## 5.5 Modeling of the Mobile Content Business into MOB

This chapter describes how the mobile content business is to be modeled and implemented into MOB. The mobile content business decision window is shown and some limitations in modeling of the mobile content are presented. There is also an illustration about the need of mobile content in MOB, based on feedback from students of the course S-38.041 Networking Business.

### 5.5.1 The Mobile Content Business and MOB

#### The Need for the Mobile Content Business in MOB

The feedback from the participants in the MOB sessions during April 2004 can be seen from Table 11.

**Table 11.** Feedback about the need for the mobile content business in MOB (MOB sessions April 2004).

	I totally agree	I agree	I agree/ I don't agree	I don't agree	I totally don't agree	I can't say/ no comments
Which of the following features would, in your opinion, be good to have in MOB?						
<b>The mobile content business</b>	<b>8</b>	<b>13</b>	<b>8</b>	<b>4</b>		<b>4</b>

The majority of the participants thought that it would make sense to include the mobile content business into MOB. The mobile content business is not the core competence of the mobile operator, but it is an important part in the value chain. The mobile operators are in a strong position because of their micro-payment, billing and charging mechanisms.

As described earlier, the mobile content business is under steady growth in Finland. The Finnish mobile operators look for new revenue streams to compensate for the decreasing voice revenues. SMS has been the most widely used technology but MMS and WAP, or 2,5G services, are catching up. A lot of money has been invested in both MMS and WAP platforms and the invested capital now needs to get paid back.

### **Limitations in Modeling of the Mobile Content Business into MOB**

When modeling different aspects of the mobile operator business into MOB, simplification is needed. This holds true also for the mobile content business. This business is fragmented by nature and the content that is being offered can be almost anything, e.g. logos, wallpapers, themes, ringtones, music, news and bus tickets. However, at least a division into digital and physical content can be done fairly easy.

There can be many players that are part of the mobile content value chain, but in MOB most of these can be combined. For simplicity, only three parties need to be part of the mobile content business in MOB. One is the end-users, i.e. the subscribers. In the middle we have the mobile operator itself. In MOB the teams function both as a MNO and a MSO at the same time, i.e. these two are not separated. However, the teams can, as will be described in the MVNO chapter, offer its network to new MVNO's. The third part in the mobile content value chain in MOB is the content providers, which also can be the actual owners of the content. The important thing is for MOB to be able to illustrate what the mobile content is all about in a simple way.

## **5.5.2 Solution**

### **The Decision Window**

The decision window for the mobile content business can be seen in Figure 10. The most important modeling issue here is the division between digital and physical mobile content. The physical content can be books, car washes, bus tickets, parking tickets, vending items etc. These are here combined under a single element that is simply called physical content.

Digital content again is divided into specific items. These are:

- Games: simple downloadable Java based games;
- Music: different kinds of ringtones and music clips;
- Information: e.g. different kinds of news;
- Other: wallpapers, logos, themes and other mobile content that doesn't fit to the other three categories.

Mobile Content				
	Digital			Physical
	Games	Music	Information	Other
<b>Usage &amp; pricing</b>				
Previous season:				
Number of content users:				
Average price (€/transaction):				
Transactions (transaction/user/month):				
Total induced traffic volume (MB/month):				
Next season:				
Estimated number of content users:				
Average price (€/transaction):				
Estimated transactions (transaction/user/month):				
Estimated total induced traffic volume (MB/month):				
<b>Revenue share</b>				
Previous season share of revenue:				
Next season share of revenue:				
<b>Partner relationships</b>				
Number of content providers:				
Previous investment on partner relationships (€):				
Next investment on partner relationships (€):				
<b>Revenues</b>				
Revenues previous season (€):				
Estimated revenues next season (€):				

**Figure 10.** The mobile content business decision window in MOB.

The mobile content decision window is further divided into usage and pricing, revenue share, partner relationships, and revenues. In usage and pricing part there is first for the previous season the actual usage for the different content types at a given average price. Below the values of previous seasons, the player then gives the average price (€/transaction) and the estimates for the next season usage for all the content types. Observe that the usage does not only depend on the average price as will be explained later when discussing the dependencies related to other items in MOB.

The next decision the player has to make is to define the operator's share of revenue. The investment on partner relationships follows, which is needed to get more content services into the network and hereby increase the value the operators are able to offer for subscribers. The last item in the mobile content decision window is the revenues.

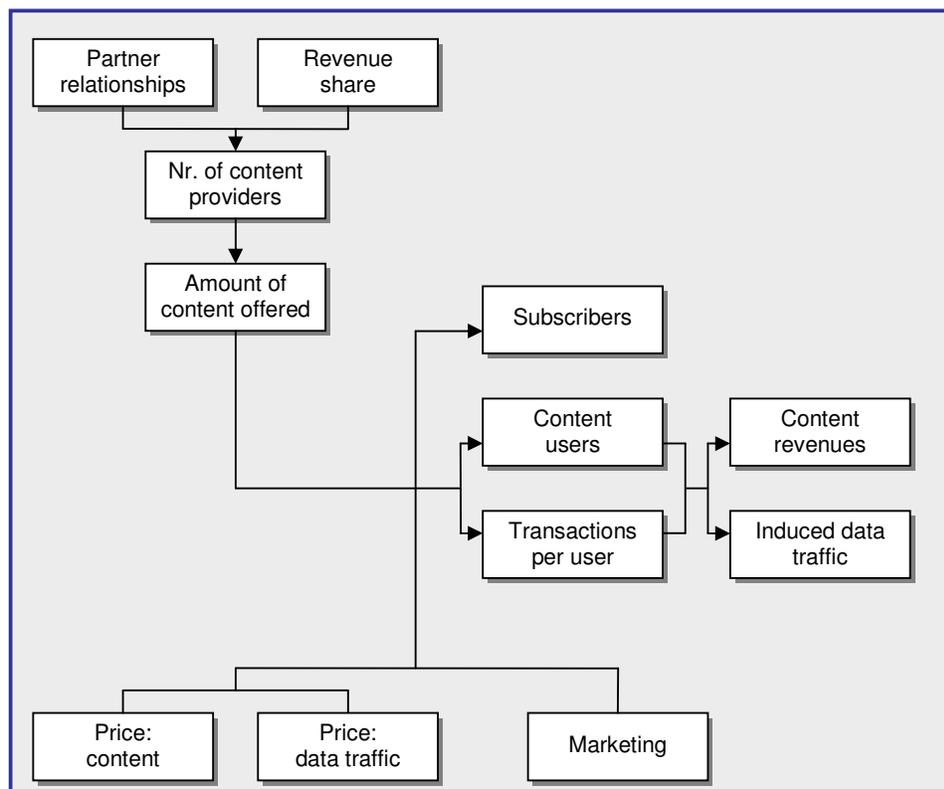
The major decision that the teams need to make is how important the mobile content business will be in their service offering. To be able to succeed in the mobile content game the teams need to figure out how much marketing is needed, how much they will spend on partner relationships, and what kind of pricing and revenue sharing strategies they will use. By not charging the

content providers, the operators can be seen as merely bit pipe operators. By investing more than others on partner relationships, the operators can possibly gather more partners and hence be able to provide exclusive content.

Mobile content strategies that are not possible according to this modeling are e.g. the choice to bundle mobile content with transport and selling of charging and billing capacity, e.g. by transaction fees and by monthly subscription fees.

### Dependencies

The mobile content business in MOB adds complexity to the game. The dependencies that will be added are illustrated in Figure 11. The number of content providers that are willing to offer their content on an operator's network depends on how much money the operator is willing to invest on partner relationships and how it decides to share the revenues from the content. This will affect how the subscribers value the operator as whole. More content offered leads to more usage and hopefully also to more subscribers to the network. This in turn leads to higher revenues for the operator. However, there are other dependencies that will affect the content usage. The operator needs also to consider how it will price the content. Also the pricing of data will reflect on the overall content usage, as will the marketing efforts.



**Figure 11.** The dependencies in MOB due to the mobile content business.

## 6 ROAMING BUSINESS

Roaming is defined as the ability for a cellular customer to automatically make and receive voice calls, send and receive data, or access other services when outside of the geographical coverage area of the home network, by means of using a visited network. Technically roaming is supported by mobility management, authentication and billing procedures. The commercial terms and the establishment of roaming between different network operators is contained and defined in so called roaming agreements. (GSM Association, 2004)

There are different terms for different types of roaming, e.g. national roaming, international roaming or global roaming, inter-technology roaming, and inter-regional roaming. There are also different types of roaming based on technologies and services, such as GSM roaming, GPRS roaming, SMS roaming, MMS roaming etc. But, the main principle is the same: to be able to use services of the operator that the user has subscribed to in another operators coverage area.

### 6.1 *Why Roaming?*

Roaming over GSM networks has become a key service over the last few years and one which has generated a good amount of revenue for the network operators. GSM Roaming, which involves roaming between GSM networks, offers the convenience of a single number, a single bill and a single phone with worldwide access to over 205 countries. The convenience of GSM Roaming has been a key driver behind the global success of the GSM platform. According to the GSM Association over 20000 roaming agreements have made the GSM service available around the world until the end of year 2001; the same is expected also for GPRS and further for 3G. The GSM Association estimates that more than 6 billion roaming calls were made in year 2000 in GSM networks. (Pohjola et al., 2004 and GSM Association, 2004)

International roaming can be considered as most valuable for both end users and operators, at least for now. Inter-technology roaming will probably offer lots of revenues for different networks operators around the world, but we are not quite there yet. The same can be stated for national roaming. National roaming can play a vital role in the deployment of 3G, at least in short term.

The most important characteristics of international roaming are to be reachable and to be mobile. It can be extremely important for a customer of a foreign mobile operator to be able to use mobile communication services also when outside of his or her home network.

## 6.2 Roaming Issues and Concerns

This and the next subchapter are largely based on the paper *Roaming Dynamics in GPRS and Beyond: Options and Strategies* (Pohjola et al., 2004). The paper discusses e.g. roaming related issues and concerns, and lists out three possible business model scenarios in roaming. The roaming related issues and concerns will be presented in this subchapter and the business model scenarios in the next subchapter.

According to the paper, a simplified business objective of a mobile operator would be to maximize the profit of the total business. This could easily be presented as in the formula below:

$$\text{Profit} = \text{ARPU} * \text{Subscribers} - \text{Cost}$$

This is of course a very simplified version of the real world. It needs to be noted here that the profit of a certain individual service, such as roaming, will not be maximized.

When making roaming decisions the basic questions a mobile operator needs to consider are as follows:

- How to gain the most value to my customers;
- How to attract new customers;
- How to get the maximum number of visiting customers;
- How to get the most money from my visiting customers;
- How to minimize the cost.

The writers of the paper have also listed some decisions that a mobile operator has to make when roaming is considered. These decisions are listed below:

- Who are the international roaming partners;
- Do we benefit from national roaming;
- How should we arrange content roaming;
- Is cross technology roaming needed;
- To which technologies and services do we offer roaming;
- Should we implement prepaid roaming;
- What is the pricing for end users;
- What is the pricing for other operators;
- What do we have to pay for other operators?

The decisions that were mentioned above will have several implications on the mobile operator's business and it is very difficult to fully understand how one single roaming decision can and will affect the operator's business objective as a whole.

### 6.3 Roaming Model Scenarios

This subchapter discusses the possible business model scenarios according to the paper *Roaming Dynamics in GPRS and Beyond: Options and Strategies* (Pohjola et al., 2004).

They have identified three possible roaming business models. The models are as follows:

1. *Bilateral model*: This includes bilateral roaming agreements and bilateral transport resource allocations.
2. *Clustered model*: This model assumes competition between international operator alliances. An operator secures the necessary global roaming coverage by joining an international alliance. This captures the current formation of global mobile operator families and corresponds to GRX (GPRS Roaming eXchange) operator clusters.
3. *Centralized model*: This model would represent an ideal vision about a global centralized non-profit clearing house for international roaming based on inter-governmental treaties. Currently, there is no existing real-world example for this scenario.

**Table 12.** Roaming dynamics triggers.

Triggers/ Models	Bilateral	Clustered	Centralized
Number of contracts	High	Low	Low
Complexity of single contract	High	High	Low
Management structure	Distributed	Centralized	Centralized
Vertical bundling	Yes	Yes	No
Control of standards' specifications	GSM MoU	Global operator	Inter-governmental
Competition in roaming features	No	Yes	No
Price regulations	No	No	Yes
Cost per operator	High	Low	Low
Profit opportunity	Medium	High	Low
Time-to-market	High	Medium	Low
Technological evolution (2G/2.5G/3G)	Low	High	High
Inter-operator relationship (subsidiary)	Low	High	High
Inter-operator relationship (independent)	High	Low	Low

Table 12 summarizes triggers that could be responsible for an operator to choose one of the roaming models presented above. In the paper, these are further classified as business and technological in nature.

### 6.3.1 Business Triggers

The business triggers and their impact on the three models are:

- *Number of contracts*: This gets higher in a bilateral model and hence an operator may find it beneficial to choose a clustered or centralized model.
- *Complexity of single contract*: This remains high in bilateral and clustered models and hence a centralized model is preferable.
- *Management structure*: Bilateral model will have a distributed structure providing greater opportunity for experimentation. The other two models will be centralized making them more rigid.
- *Vertical bundling*: Tying the transport with the content is possible in bilateral and clustered models while centralized will follow agreements only at the transport level (horizontal). This reduces the complexity of agreements.
- *Price regulations*: Regulators will find it difficult to control the prices in a bilateral or clustered model. Hence, a centralized model will be preferred.
- *Cost per operator*: This would be higher in a bilateral model due to a greater number of contracts.
- *Profit opportunity*: A clustered model enhances profits for an operator as it provides greater opportunity for roaming feature differentiation.
- *Time-to-market*: Bilateral model takes a longer time to achieve the same number of agreements compared to other two models.
- *Inter-operator relationship*: Operators having subsidiaries or joint ventures with other operators are likely to favor a clustered or centralized model than if they are independent of each other.

### 6.3.2 Technological Triggers

The technological triggers and their impacts are:

- *Control of standards' specifications*: A dominant cluster will have greater influence on standards specifications unlike in bilateral or a centralized model in which standards are created based on consensus among all operators.

- *Competition in roaming features:* The control of standards would provide the clusters an opportunity to offer better features unlike other two models. This would encourage competition among the clusters.
- *Technological evolution:* As the technology evolves from a circuit-switched GSM to a packet-switched 2,5G and beyond, clustered and centralized models will achieve a higher degree of acceptance among operators.

A clustered model might become more common as the technology evolves from circuit-switched GSM to a packet-switched 2,5G and beyond. A clustered model will also indirectly impact national competition among operators. An operator can become more competitive at the national level by becoming a member of a large international cluster, thus providing wider international coverage and other benefits to its customers in roaming services.

A centralized model can become a reality if the regulators plan to control the roaming regime and thus curtail the increased pricing. This would in turn mean lower profits for the operators.

In the paper Pohjola et al. argues that there is a greater possibility of bilateral and clustered models existing in parallel and that this will more likely be the case in the future unless a centralized model is introduced by some internationally recognized body.

## **6.4 Roaming: Case Finland**

In Finland, international roaming services are offered by four mobile operators: TeliaSonera, Elisa, Finnet Networks, and Ålands Mobiltelefon. A foreign mobile operator has everywhere in Finland always at least two operators to choose its roaming partners from. To date, Finnish mobile operators have signed approximately 800 international roaming agreements. There have not been any problems on the international roaming market in Finland so far. FICORA sees that none of the mobile operators are Significant Market Powers (SMP) on the international roaming services market in Finland. FICORA is continuously following possible changes and developments to the competitive situation, though. If necessary, FICORA makes changes to its decisions regarding SMP on the international roaming market. (FICORA, 2004)

### **6.4.1 TeliaSonera**

The TeliaSonera GSM mobile subscription can be used already in 157 countries. The subscribers to TeliaSonera can choose from 250 different operators when traveling abroad. The operators' GPRS service can be used in 57 countries worldwide. TeliaSonera also offer GRX services and the customer base of TeliaSonera's GRX service includes all the other Finnish mobile operators. (TeliaSonera, 2004)

### 6.4.2 Elisa

Subscribers to Elisa can use the GSM service in almost 150 countries and with almost 250 operators. Elisa has also signed over 50 GPRS roaming agreements. Elisa is cooperating with the world's largest mobile operator Vodafone to improve international competitiveness. (Elisa, 2004)

### 6.4.3 Finnet Networks

According to the Finnet Networks homepages, Finnet Networks has collaboration agreements with nearly 150 network operators worldwide. (Finnet Networks, 2004)

### 6.4.4 Ålands mobiltelefon

According to the homepages of Ålands mobiltelefon it has GSM roaming agreements with 114 mobile operators (in 71 countries) and GPRS roaming agreements with 15. (Ålands mobiltelefon, 2004)

## 6.5 *Modeling of the Roaming Business into MOB*

This chapter will describe how the roaming business could be modeled and implemented into MOB. A roaming decision window will be showed and some problems concerning the modeling of the roaming business will be presented. There is also an illustration about the need of roaming in MOB, based on the feedback from students of the course *S-38.041 Networking Business*.

### 6.5.1 The Roaming Business and MOB

#### The Need for the Roaming Business in MOB

The feedback from the participants in the MOB sessions during April 2004 can be seen from Table 13. From the table it can be seen that most of the participants felt that this feature would add value to the game. The comments were as follows:

- *Roaming is an important issue and it needs to take into consideration;*
- *Roaming would be a nice extra for the pricing portfolio;*
- *Roaming would add more possibilities for differentiation;*
- *A hot topic! The roaming agreements are very important for the operators.*

But, many of the participants who thought that the roaming business would be a nice addition to MOB were also a little skeptical about if it would be possible to model it into MOB in a simple way. Many were afraid that it would add too much additional complexity to the game.

**Table 13.** Feedback about the need for the roaming business in MOB (MOB sessions April 2004).

	I totally agree	I agree	I agree/ I don't agree	I don't agree	I totally don't agree	I can't say/ no comments
Which of the following features would, in your opinion, be good to have in MOB?						
The roaming business	9	12	7	7		2

### **Limitations in Modeling of the Roaming Business into MOB**

There are several different types of roaming. However, for simplicity it is of no use to try to implement all of these into MOB. Inter-technology roaming, like the roaming between WLAN and cellular, might become more important in the future. But, for now international roaming is the most important type.

The centralized model would, as mentioned earlier, represent an ideal vision about a global centralized non-profit clearing house for international roaming. However, there is no existing real-world example for this scenario and this type of roaming model might never even become a reality. For simplicity it makes sense to leave this scenario outside of the scope of MOB. But, both the bilateral and the clustered models suit well into today's situation. The bilateral model is widely used and the clustered model is becoming more important due to different international alliances and GRX operator clusters.

## **6.5.2 Solution**

### **Decision Window**

The decision window for the roaming business can be seen in Figure 12. The most important modeling issue concerning roaming decisions is about which roaming model, bilateral or clustered, is used during a specified time in MOB. At the beginning the bilateral roaming model is used by all the teams. However, during the game the possibility to change to a clustered model will become possible. The teams will then choose which of the roaming models will suit to their current situations. A limitation is that after choosing the clustered roaming model the teams can not change back to a bilateral model any more. The clustered model does not mean that all the bilateral agreements will become obsolete. There are still operators that do not belong to the cluster for which a bilateral agreement, or contract, needs to be written.

At the top of the roaming decision window are the general issues concerning roaming in MOB. Here the players can see how many international clusters there are to join. Here the players can also find information about how many mobile operators have joined the cluster. For simplicity, the clusters are all the

same size. The teams can also find information about how much it will cost for them to change from a bilateral to a clustered roaming model. Underneath this information is a box for the decision to change the roaming model.

The rest of the roaming decision window is divided into a cost part and a revenue part. These two parts are further divided into the four services that the teams can offer for roaming customers. These are voice services, SMS, MMS and data services. WLAN roaming will not be possible in MOB at this point.

Roaming				
Roaming decisions				
International clusters:	<input type="text"/>			
International mobile operators / cluster:	<input type="text"/>			
Switching cost: bilateral => clustered:	<input type="text"/>			
Switch to clustered model (Yes/No):	<input type="text"/>			
	Voice	SMS	MMS	Data
Roaming model:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Previous season roaming contracts:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Estimated next season roaming contracts:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Cost/contract:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Investment on roaming relationships:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Roaming costs:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Total roaming costs:</b>	<input type="text"/>			
Outbound roaming	Voice	SMS	MMS	Data
Previous season outbound roamers:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Estimated next season outbound roamers:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Previous season average usage/month/user:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Estimated next season average usage/month/user:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Previous season outbound roaming fee:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Next season outbound roaming fee:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Outbound roaming revenues:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Inbound roaming	Voice	SMS	MMS	Data
Previous season inbound roamers:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Estimated next season inbound roamers:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Previous season average usage/month/user:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Estimated next season average usage/month/user:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Previous season inbound roaming fee:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Next season inbound roaming fee:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Inbound roaming revenues:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Total roaming revenue:</b>	<input type="text"/>			

**Figure 12.** The roaming business decision window in MOB.

The costs part of the roaming decision window is divided into: the actual roaming model that is used, the amount of roaming contracts, the cost/contract, investments on roaming relationships, and the different roaming costs. The decision item that the players can use to influence the amount of roaming contracts is the investment on roaming relationships. Higher amount of roaming contracts automatically leads to better global coverage for the customers, hence better offered service. This is important especially for corporate customers, but it also adds value for the traveling consumer. Note that the amount of roaming contracts is not the only parameter that the

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consumer finds important when choosing his or her service provider. The actual roaming fees are also important when the end-user makes his or her decisions about roaming.

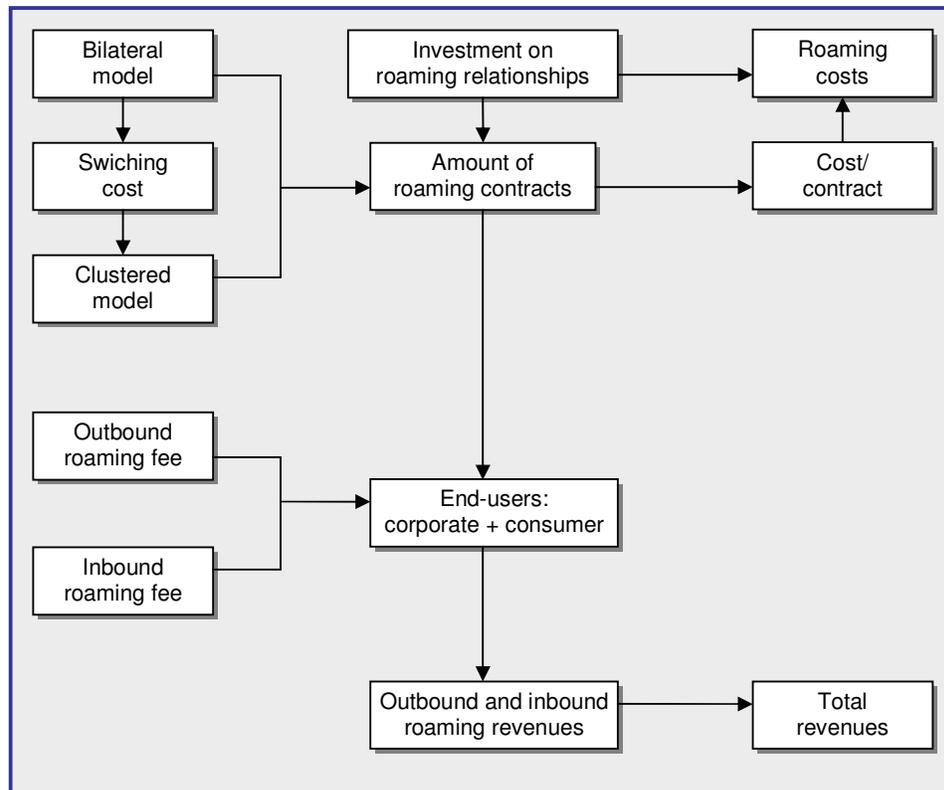
The revenues part of the roaming decision window is divided into outbound and inbound roaming. The information and decision parameters are similar for both of these so only the outbound roaming will be described here. Here the players can find information about the amount of outbound roamers, the average usage by roaming customers, and the roaming fee that is the teams charge the roaming customers. The only actual decision parameter is the roaming fee for voice, SMS, MMS and data usage. The roaming fee is a fee that is added to the price for these services while in the home network. The last item in both the cost and the revenue parts of the roaming decision window are the total costs and revenues from roaming.

The major decision that the teams need to make concerning roaming is how important this business will be in their service offering. The teams need to make their roaming decisions according to what segment, or which segments, they are concentrating their offering for. Investments on roaming relationships and the pricing for roaming play a vital role. Another strategic decision is which roaming model the teams select to during the game.

### **Dependencies**

The roaming business is probably the most complex item described in this thesis. The complexity of MOB will grow considerably by adding roaming into the game. The dependencies that will be added due to the roaming business are illustrated in Figure 13.

The amount of roaming contracts depends on how much the team is ready to invest on roaming relationships. However, as the amount of roaming contracts increases, the roaming costs will also increase. This is because there is a fixed cost related to every roaming contract. The amount of roaming contracts will decrease as the teams choose to switch to the clustered roaming model. There is a switching cost related to the switch from bilateral to clustered model, but at the same time the amount of contracts will decrease because only one contract is needed between the cluster and the team. A contract between the team and a roaming cluster equals the amount of roaming contracts as there are mobile operators belonging to the cluster, i.e. the value for the end-user stays the same, but the roaming costs will decrease.



**Figure 13.** The dependencies in MOB due to the roaming business.

As the count of roaming partners increases, so does the value of roaming that is offered to the end-user. The other items that impact the perceived value by the end-users are the roaming fees, both for outbound and inbound roaming. The lower the fee, the higher the perceived value! If the end-users feel that the roaming service that is offered is good enough the team will have the opportunity to raise higher roaming revenues and also increase its total subscriber base.

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## 7 MOBILE VIRTUAL NETWORK OPERATOR (MVNO) BUSINESS

### 7.1 *The Definition of a MVNO*

MVNO stands for Mobile Virtual Network Operator. Once past the acronym, it becomes much more problematic to provide a good and solid definition of what it is about. The reason for it being so difficult to come with one definition is that there can be many levels of MVNO's. There can be many ways in which a MVNO can be formed, and many types of MVNO's can and will compete in the same market space. The regulators are welcoming the MVNO's because they enhance competition for the benefit of the end users.

A mobile virtual network operator (MVNO) provides cellular services without owning access rights to spectrum. From the customers' point of view, a MVNO looks like any other cellular operator, but a MVNO does not own or operate the base station infrastructure.

According to Lillehagen et al. a MVNO must, from a customer perspective, appear to be a MNO, having the same interfaces towards the customers as a MNO. The question for a MVNO is how "deep" (with customer facing being the highest, and radio access provisioning being the lowest) into the value system it should go. The MVNO has to consider which facilities to own and run, which to outsource and which to lease from the MNO and what type of agreements it should seek with partners in order to appear as an attractive choice to the customers. (Lillehagen et al., 2001)

The versatile backgrounds of MVNO's can be divided into three groups: (Kristensson & Gahnström, 2001)

1. Fixed network operators;
2. Mobile network operators in another geographic market;
3. Companies with non-telecom business at the geographical market.

For a MVNO having no background in telecommunications it is typical to have a strong brand known from its other operations (e.g. Virgin Mobile). (Kiiski & Hämmäinen, 2004)

The number of MVNO's has steadily been growing and it will almost certainly grow also in the future. There are clear advantages in any agreement for both the network operator, who wants to maximize revenue from spectrum, and the MVNO, who will be able to use their unique position to attract subscribers.

By selling network capacity to one or several MVNO's, the MNO can get new subscribers and traffic into its network, hereby broadening the customer base at a low cost of acquisition. Selling of the capacity is also an efficient way to share the network costs. But, the entrance of a MVNO is likely to lower the prices in the market. Therefore it can be said that the situation is kind of paradoxical: MNO's should not let MVNO's in unless they are certain that the

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MVNO in question will not enjoy significant success. (Kiiski & Hämmäinen, 2004)

Without doubt, to survive an MVNO needs to be profitable. The main source of income derives naturally from the customers. The customers pay for call connection and services. The second source of income can be the interconnection payments from other operators. But, in order to succeed an MVNO must be able to provide innovative services since this is a unique source of income that it controls totally. (Van Thanh, 2001)

On the cost side, the MVNO has to pay to the MNO for both outgoing and incoming calls. In addition, it may need to pay interconnection payments to other operators for completing outgoing calls. Last, but not least, it has also investment, marketing and operational costs. An MVNO needs to reach commercial agreements with a MNO concerning the charging for access to the radio spectrum. Currently there are two possible schemes: cost plus charging and retail minus charging. In the cost plus charging, the payment is derived from the MNO's actual costs. In the retail minus charging, the payment is the MNO's retail price minus some discount. Usually, the retail minus charging is higher and less advantageous for the MVNO than cost plus charging. (Van Thanh, 2001)

## **7.2 MVNO Business Strategy Scenarios**

This subchapter is based on the paper *Mobile Virtual Network Operators: Case Finland* (Kiiski & Hämmäinen, 2004). In the paper the MVNO business strategies are divided into five main groups. The groups are as follows:

- Low price;
- Narrow focus;
- Service differentiation;
- Service reselling;
- International clustering.

When a MVNO's business strategy is based on offering services with *low price*, the main competitive advantage must be the ability to keep the costs low. This could of course also be called a cost leadership strategy. All the operations of the MVNO that chooses to compete with low prices must be aligned to meet this target. The service portfolio should be narrow, including only the basic services for selected, rather large customer groups because of the small profit margins. In the paper Kiiski & Hämmäinen also argue that low organizational structure, large customer potential, and short reaction time to changes in the market are benefits for the MVNO's following this low price strategy.

MVNO's that select to *focus* on one customer segment, or perhaps a small number of well defined customer segments, typically can't achieve business volumes big enough to justify investments on own service platforms. Tailored marketing and customer care for the chosen customer segment/segments allow setting the expected ARPU high. According to Kiiski & Hämmäinen, strategic alignment between the partnering MNO and MVNO is typically good since a large MNO can't easily focus on small niche segments.

A MVNO can also select to offer *differentiated* services for demanding customers. Here the service mix should be rather large to attract customers, especially business customers. While competing with differentiated services, a MVNO has the potential to gain a rather high ARPU. Kiiski & Hämmäinen argue that a major disadvantage of this strategy option has been the absence of profitable business models: users are not ready to pay for the services.

MVNO's with strong technology competences but low brand value can select to become a *reseller* and enabler for other MVNO's that already have a strong brand. This strategy requires large customer volumes due to the low expected profits, which according to Kiiski & Hämmäinen is likely to create conflicts of interest with the supplying MNO. The support from the regulator appears particularly crucial for this strategy.

Global and regional MNO's can select to enter a new market as a MVNO instead of investing in or acquiring a local MNO in the new market. Kiiski & Hämmäinen call this approach international *clustering*. This approach enables a fast initial service roll-out if the foreign MNO can use its existing service machinery located outside of the target market, as well as their existing service portfolio.

### **7.3 The Finnish MVNO Market**

The Finnish MVNO market is becoming more and more interesting due to the large and steadily increasing number of different MVNO's. We have already seen many different types of players and the amount has risen to over fifteen MVNO's with quite different types of backgrounds (Table 14).

Recent changes in regulation have made the market easily accessible for MVNO's. The most effective change in regulation, and an effective trigger for MVNO's to start their operations, was the requirement to enable mobile number portability (MNP) between mobile network operators in July 2003. (Kiiski & Hämmäinen, 2004)

The main business strategy of the Finnish MVNO has been to compete with price. Thus far, only few MVNO's have chosen another than the low price strategy.

**Table 14.** The player's on the Finnish mobile operator market. (Modified from Kiiski & Hämmäinen, 2004)

MNO	Incumbent MSO,	MVNO	Brand operator
<b>TeliaSonera</b>	TeliaSonera	Saunalahti ACN Finland FinnetCom NetFonet Tele Finland CDF Mobile	SK Ravintolat Hesburger
<b>Elisa</b>	Elisa	Cubio Tele2 MTV3 Song Networks Kolumbus	
<b>Finnet Networks</b>	DNA Finland	Fujitsu Services PG Free Spinbox Maingate	

Saunalahti can be considered as the biggest player in the MVNO market space in Finland. They have currently almost 308000 subscribers and its market share has grown rapidly during the last year. At the end of year 2003 Saunalahti had some 143000 subscribers, so the growth has been quite remarkable. Saunalahti cooperate with two Finnish MNO's: TeliaSonera and Elisa. Saunalahti uses TeliaSoneras network and the cooperation with Elisa is mainly based on improving its international roaming service.

#### **7.4 Modeling of the MVNO Business into MOB**

In this chapter a description on how the MVNO business could be modeled and implemented into MOB. A MVNO decision window will be and some limitations in modeling of the MVNO business are presented, and there is also an illustration about the need of the MVNO business in MOB, based on the feedback students gave during the course *S-38.041 Networking Business*.

##### **7.4.1 The MVNO Business and MOB**

###### **The Need for the MVNO Business in MOB**

The feedback from the participants in the MOB sessions during April 2004 can be seen from Table 15. From this table it is clear that the MVNO business should be implemented into MOB. The MVNO business has fast become a well known phenomenon in Finland. This has largely been a consequence of lighter regulation and MNP. I feel that this is the reason why so many felt that the MVNO business should be a part of MOB. In Finland the market share of different MVNO's has quickly risen to over 10 percent and their market share will keep on growing at least short run.

**Table 15.** Feedback about the need for the MVNO business in MOB (MOB sessions April 2004).

	I totally agree	I agree	I agree/ I don't agree	I don't agree	I totally don't agree	I can't say/ no comments
Which of the following features would, in your opinion, be good to have in MOB?						
The MVNO business	14	10	6	4		3

Comments from the participants were as follows:

- *The MVNO business would correspond to the real world very nicely;*
- *If well implemented it should be in the game;*
- *The MVNO's play an import role nowadays, especially in cost leadership strategy;*
- *A relevant and emerging business model;*
- *This would be an interesting feature. MVNO's have just entered the Finnish mobile market and it would be intriguing to examine the dynamics they bring to the game;*
- *This will be an essential element of the competitive field of mobile operator business in the near future.*

However, here were again concerns about the complexity of the game. Many thought that it would certainly extend the value system and be good to have, but only if it would not add too much to the complexity of the game.

### **Limitations in Modeling of the MVNO Business into MOB**

There are many ways in which a MVNO can be formed, and many types of MVNO's can and will compete in the same market space. To keep the MVNO part simple for the player, it is not important to model all types of MVNO into MOB. However, the player should be able to learn by playing MOB that MVNO's are part of the mobile operator business and that they are becoming more common. The regulators feel that MVNO's enhance competition and they can concentrate more on smaller segments than the traditional MNO's.

The MVNO agreements between the MNO's and MVNO's are well kept secrets and the process would be interesting to teach to the players. But, it would increase the complexity of MOB dramatically and is hereby left outside of the scope of the game.

## 7.4.2 Solution

### Decision Window

The MVNO decision window can be seen in Figure 14. At the beginning of the game there are no MVNO's on the market. However, during the game new MVNO's may emerge. The teams can choose if they want to take MVNO's on their networks. If the team decides not to offer its network to MVNO's, they do not need to fill in anything into the rest of the MVNO decision window.

The decision window shows the general MVNO issues. The players can see how many MVNO's there already are on the market, but also how many new potential MVNO's there are. The rest of the MVNO decision window is divided into "offers for MVNO's" and "your MVNO's". In the first part the teams can choose under which conditions they offer their network to the MVNO's. The offers must be the same for all the MVNO's according to a decision by the regulator in MOB. The offer consists of a fixed part, a charge per subscriber part, and a part for the actual usage.

MVNO				
<b>MVNO decisions</b>				
MVNO's on the market:	<input type="text"/>			
Potential new MVNO's:	<input type="text"/>			
MVNO's on your network previous season (Yes/No):	<input type="text"/>	Allow MVNO's		
MVNO's on your network next season (Yes/No):	<input type="text"/>	YES NO		
<b>Offers for MVNO's:</b>				
Fixed part (k€):	<input type="text"/>			
Per subscriber (€):	<input type="text"/>			
Per usage:	Voice (€/min)	SMS (€/SMS)	MMS (€/MMS)	Data (€/MB)
	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Your MVNO's:</b>				
Maximum amount of MVNO's on your network next season:	<input type="text"/>			
Amount of MVNO's on your network previous season:	<input type="text"/>			
Estimated amount of MVNO's on your network next season:	<input type="text"/>			
Amount of MVNO subscribers previous season:	<input type="text"/>			
Estimated amount of MVNO subscribers next season:	<input type="text"/>			
	Voice	SMS	MMS	Data
Previous season average usage/month/user:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Estimated next season usage/month/user:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Revenues (k€):	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Estimated total revenues (k€):	<input type="text"/>			

**Figure 14.** The MVNO business decision window in MOB.

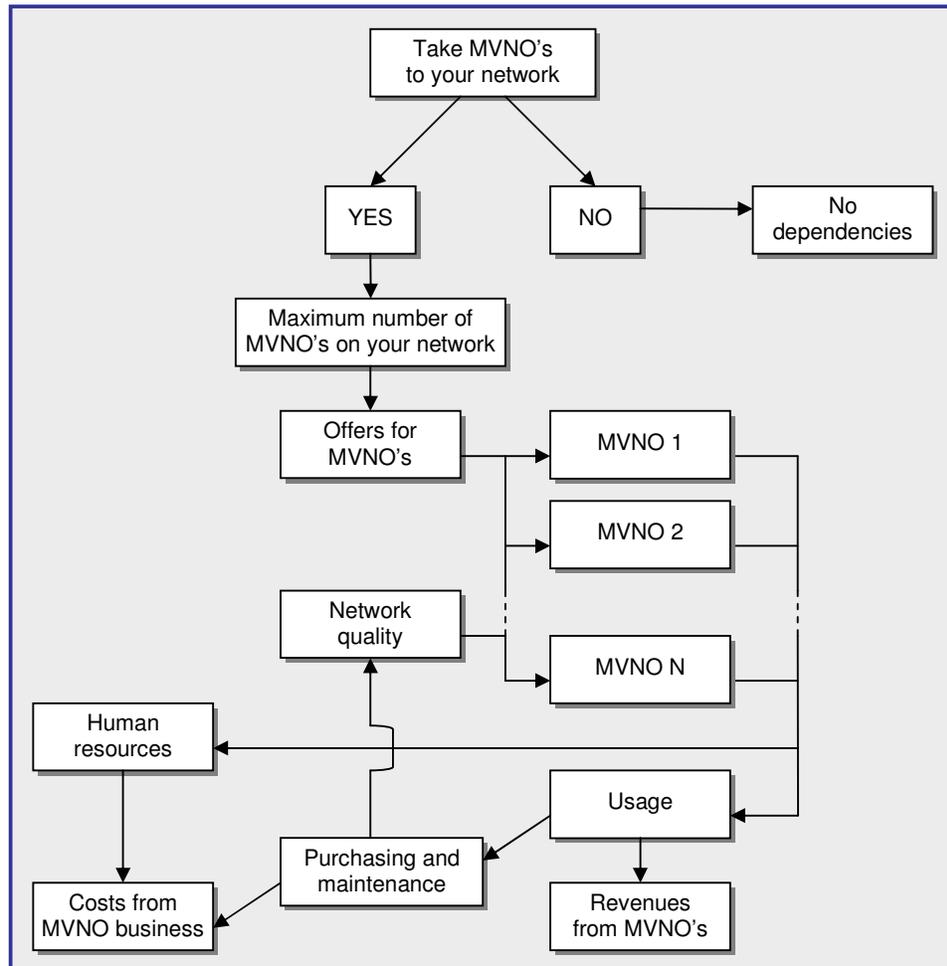
The last part of the decision window presents the player's MVNO portfolio. Here the players can decide the maximum amount of MVNO's that they will serve. The players can also find information about previous seasons concerning MVNO's from here, and give estimates for the next season.

The major decision that the teams need to make concerning MVNO's is how they plan to optimize the usage of capacity their networks. The team's strategic alternatives are to allow MVNO's to use their networks or they can decide not to join the MVNO game. If they allow MVNO's to their networks

these can be considered as either strategic partners or as competitors using them as a retail channel.

### Dependencies

The dependencies that will be added due to the MVNO business are illustrated in Figure 15.



**Figure 15.** The dependencies in MOB due to the MVNO business.

If the players decide not to offer their network to MVNO's there will not be any dependencies either. However, when MVNO's are allowed to use the network the teams have to decide the maximum amount of MVNO's they will serve. The MVNO's bring revenues to the MNO's, but they also use capacity and resources. The costs due to offering network capacity to MVNO's consist of human resource, purchasing and maintenance costs.

As the amount of MVNO's increase, so does the competition on the market. This does not only mean that end-user prices will fall, it also means harder competition between the offers for MVNO's. The network quality might also play a vital role when MVNO's choose their carrier.

## 8 HANDSET BUSINESS

This chapter mainly focuses on the subsidy issue of the mobile handset business. The chapter tries to explain what handset subsidies are all about, why handset subsidies have been used so extensively, what's good and what's bad about these subsidies, and why there recently has been so much discussion around this topic in Finland.

Handset prices may vary depending on network operator charging strategies, and national regulations. Subsidies for handsets have been a widespread practice to allow consumers to get their mobile phones at deep discounts, even for free. Recently, with 3G (and beyond) development and subsequent requirements on sophisticated and costly handsets, subsidies may be considered an important marketing factor to develop 3G customer base and market share. However, in countries like Finland and Italy that have among the highest 2G penetration rates in Europe, subsidies do not exist. In South Korea, requirements for subsidies have existed for a limited period. (Daoud & Hämmäinen, 2004)

Commercial subsidies can be considered as one reason for the rapid growth in the mobile handset industry, but of course not as the only reason. The reason behind mobile operators subsidizing handsets has been to boost their sales. This was at least the case in the beginning. But, are these subsidies needed also in the years to come? As the penetration rate has risen over 80, as it has done in several European countries, and the markets have started to saturate, we are in a situation where new subscribers of one operator already are ex-subscribers of another, i.e. they usually own a handset already.

### 8.1 Handset Subsidies

Frequently, a wireless company will sell a handset below cost, with the hope of making up the loss later on customer usage fees. The amount of loss per handset is called the handset subsidy. (Mobiledia, 2004)

During the recent years the mobile operators have raised their number of subscribers quite quickly, partly because of subsidized handsets. Today many are wondering whether the subsidization of handsets is commercially desirable and economically viable. One could argue that the money a mobile operator is spending on handset subsidies is money away from developing of for instance new mobile data services. Although it can be extremely difficult for the mobile operators to stop subsidizing handsets, once they started the practice, there are some markets that have managed to do very well without the subsidies. The handset subsidies can lead to fierce price competition and low profitability of the operators, but it can also lead, if well planned, to more usage of mobile data services and hence more revenues for the operators. It can, without doubt, be stated that there are both pros and cons in subsidizing handsets, not only for the operator, but for the end user as well.

In 2003, the British mobile service provider 3 UK, backed by Hong Kong's Hutchison Whampoa tried a new marketing tactic concerning the subsidization of handsets. What they did was to try and sell sophisticated mobile phones at full price. But, within six months, the operator was forced to cut the prices in half. The reason was that the consumers, used to getting their mobile phones at deep discounts, weren't prepared to pay as much as >600 euros, even though the phones offered sophisticated services such as two-way video calling, video downloads, a camera, a music player, email and games. The experience underscores the dilemma that is facing the world's mobile operators. Handset subsidies are an addictive marketing ploy that ends up skewing the economics of the marketplace, and in most of Europe and Asia, it seems neither buyer nor seller can live without them. (Herald Tribune, 2003)

Manufacturers do not like the subsidies because consumers do not realize the real value of their products, while carriers treat them as a necessary evil. Consumers regard mobiles as disposable when in fact cell phones are based on expensive, sophisticated technology. But, for the operators the price of the device is not related to the hardware, but to how much revenue it can generate for the mobile operator. Much of the cost is passed on to mobile operators and retailers, which in turn have to find ways to recoup their losses. So, just as there is no such thing as a free lunch, there is no such thing as a free phone. If the phone is cheap, chances are you will pay more for services. (Herald Tribune, 2003)

Next some pros and cons about handset subsidization are listed:

- Pros:
  - Because of the handset subsidies the mobile operators have been able to raise their number of subscriptions quite rapidly during the last years. Many see that the subsidies were necessary to kick start the mobile market, at least in some parts of the world.
  - Subsidization of handset might be considered as a good tool to, in short to medium term, help stimulate the adoption of next generation handsets, e.g. 3G.
  - If the handset subsidies are well planned, they can lead to more usage of mobile data services and hence more revenues for the operators.
  - Mobile operators can use handset subsidies for postpaid plans as a way to get their own subscribers to switch from prepaid plans to postpaid plans. Postpaid plans can be considered as better in that sense that the subscribers are usually paying a fixed charge for a certain amount of time.

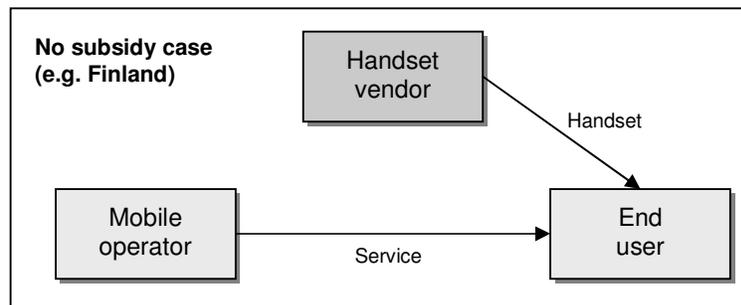
- Cons:
  - Subsidized handset requires a long term contract with the mobile operator (usually 1-2 years). This prevents the subscriber from switching to another operator.
  - It can be extremely difficult for the mobile operators to stop subsidizing handsets after they have started the practice.
  - The consumers do not realize the real value of the mobile phone. They regard the handsets as disposable goods, when in fact the handsets are based on expensive and sophisticated technology.
  - The handset subsidies can lead to fierce price competition and low profitability of the operators.
  - The mobile operators who subsidize handsets need to find other ways to recoup their losses. This usually leads to higher prices for services. There are no free lunches!

Sophisticated handsets are very important in driving up usage of advanced services and revenues. For example, since the Japanese operator DoCoMo launched their 3G FOMA service in 2001 and until 2004, it had only attracted 2 million 3G subscribers. After the introduction of the DoCoMo's new 900i handset series, they were able to increase their 3G subscriber base by 1 million subscribers in just two months. Similarly, the availability of advanced handsets, with features like color displays, has been an important factor in driving wireless data usage in South Korea. In other markets, such as Europe and United States, new technologies have been introduced at an early stage when color display handsets were not commonly available. As a result, only now when these color display handsets have been introduced have the operators noticed increase for associated ARPU. (Daoud & Hämmäinen, 2004)

### **8.1.1 Business Models: Handset Vendor has the Power**

Figure 16 illustrates the business model where the handset vendor has the power, or at least more power than the mobile operator. This is the situation in Finland. The handset is usually sold through retail stores, that can be independent or owned by the operator, and the mobile operator has little or nothing to say about how the handset should be like. In this kind of situation, where no subsidies exist, the mobile operators are in a situation where they can't influence the handset vendors, at least not for the moment. However, the situation might change in the near future. The usability of new services is a big issue at the moment, and the operators are becoming more and more interested in preconfigured handsets. Handsets that make the use of new mobile data services easier, and most importantly, easier to start to use the

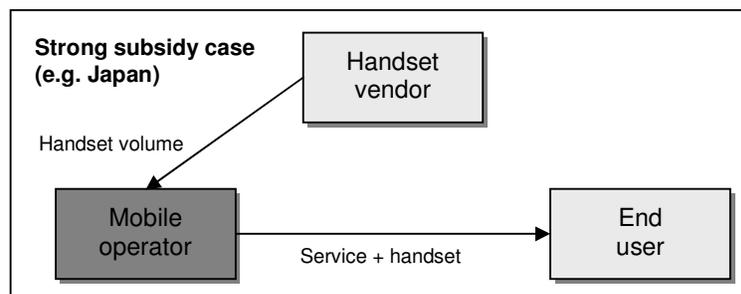
services. This will most certainly put pressure on the handset vendors, and this is one of the reasons why the handset subsidy issue has risen also in Finland, where this hasn't been possible so far.



**Figure 16.** *The handset vendor has more power. (Daoud & Hämmäinen, 2004)*

### 8.1.2 Business Models: Operator has the Power

Figure 17 illustrates the business model where the mobile operator has the power, or at least more power than in the former case. This is the situation in many countries worldwide. The handset is usually sold through the operators' own stores, and the mobile operator has the ability to put pressure on the handset vendors. In this kind of situation, where handset subsidies exist, the mobile operator is in a situation where they can demand that e.g. the operator's brand is visible on the handset and they can also require preconfigured handsets with their own service configurations ready in use.



**Figure 17.** *The operator has more power. (Daoud & Hämmäinen, 2004)*

According to Daoud and Hämmäinen, under this business model the mobile operator is able to get:

- Preconfigured handsets from the vendors (e.g. own menus);
- A stronger negotiation position towards vendors;
- Volume buying power (e.g. 10 percent discount).

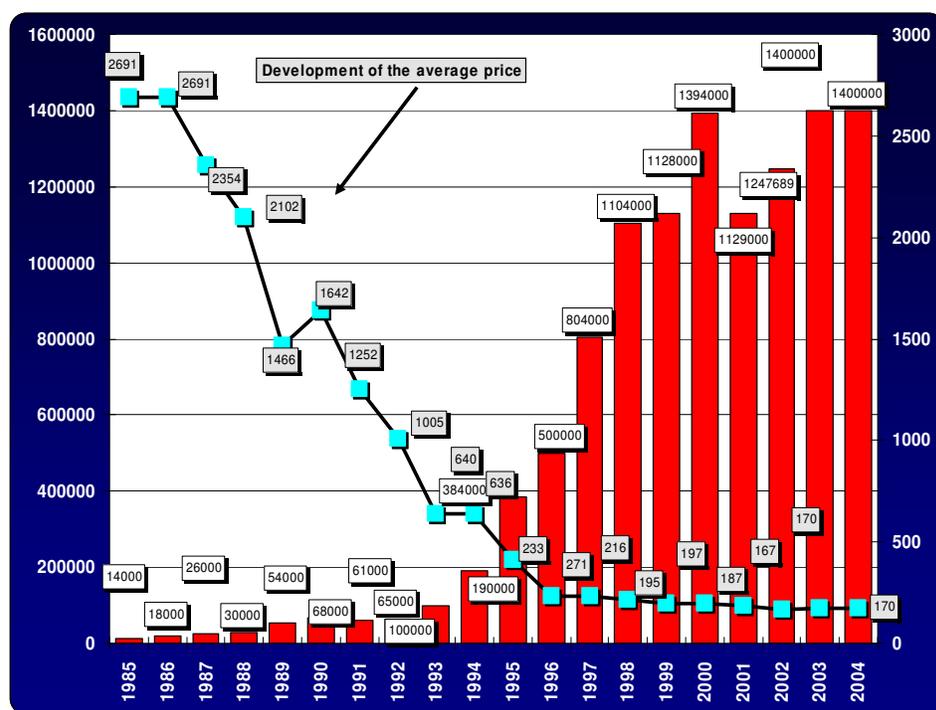
These arguments could also be considered positive from the consumer point of view. The consumer could get cheaper phones and more user-friendly mobile services.

## 8.2 The Handset Situation in Finland

The handset business in Finland is unique in many ways. Subsidization of handsets is not currently possible due to paragraph 70 of the Communications Market Act (393/2003) (Mintc, 2003). The paragraph states that the price of a mobile terminal, or an accessory related to that, may not depend on if the buyer also acquire a subscription from the seller. However, the national regulator is currently considering changes to this paragraph.

The operators in Finland are instead of handset subsidies attracting subscribers by offering free “talk time” or other bundled goods (DVD players and backpacks). The absence of subsidies has not hurt the Finnish market over the long run, but this might not be the case when the operators want to start promoting new services of 3G. Currently, due to MVNO’s and MNP the mobile operators are competing fiercely with price, as already mentioned in the MVNO chapter.

Figure 18 shows how the handset market has been developing during a 20 year period. The average price has steadily decreased and is estimated be around 170 euro in 2004. 140000 mobile phones are estimated to be sold during 2004, which is the same amount as during 2003. (Elektroniikan Tukkukauppiat, 2004)



**Figure 18.** The development of the mobile phone market in Finland (1985-2004). (Elektroniikan Tukkukauppiat, 2004)

### 8.3 Modeling of the Handset Business into MOB

In the last chapter about modeling issues in MOB, there will be described how the handset business could be modeled and implemented into MOB. A handset business decision window will be presented and some limitations in modeling of this business are presented. Also an illustration about the need of the handset issue in MOB, which is based on the feedback that the students of the course *S-38.041 Networking Business* gave, is presented.

#### 8.3.1 The Handset Business and MOB

##### The Need for the Handset Business in MOB

The feedback from the participants in the MOB sessions during April 2004 can be seen from Table 16. From this table you can see that most of the participants were very skeptical about a feature such as the handset business to be added and implemented into MOB. There are a few reasons why this might be the case. Firstly, in Finland the handset is sold completely as an independent product from the actual subscription to the carrier. As mentioned in the Handset Business chapter, this is currently not allowed according to the Finnish Communications Market Act (393/2003) (Mintc, 2003). Secondly, the participants are not aware that this might change in the future and if do change, it would most definitely also change the market dynamics.

**Table 16.** Feedback about the need for the handset business in MOB (MOB sessions April 2004).

	I totally agree	I agree	I agree/ I don't agree	I don't agree	I totally don't agree	I can't say/ no comments
Which of the following features would, in your opinion, be good to have in MOB?						
<b>The handset business</b>	<b>1</b>	<b>8</b>	<b>8</b>	<b>15</b>	<b>4</b>	<b>1</b>

Here are some comments about what the participants to the MOB sessions held in April 2004 thought about adding the handset business as a new feature into MOB:

- *Now the game is very Finland centric. By adding the handset business as a new feature into MOB would bring some international level to it.*
- *In Finland the combination of handsets and subscriptions are not allowed. Hence, I see no meaning for handset business in MOB.*
- *Perhaps not that relevant for the operators and in the Finnish market.*

- *Since in Finland handsets are sold apart from telephone services, this feature doesn't influence the situation that much. Abroad the situation would be different.*
- *This is relevant in many other European markets, however implementing this would require extending the scope of the game to international markets.*
- *The handset business is not an operator business. They do not control the production and technological developments. Only buying/selling of handset can be part of the operator business, particularly as a mean to differentiate services compared to the competitors.*
- *I really don't see a need for this. Let's keep these two businesses separate, as the regulation does.*

From some of the comments that were given above we can see that many feel that this is not relevant in the Finnish market. But, as MOB doesn't model the Finnish market, only a market that reminds the Finnish market, I feel that the handset business is of great importance. The mobile handsets might be in a key position in the adopting new mobile services and this is something that we really would like to teach to the players of MOB.

#### **Limitations in Modeling of the Handset Business into MOB**

There are quite many features in MOB already and by adding features MOB will become more complex and harder to play. The handset business is a big part of many mobile operators' businesses and modeling it appropriately into MOB can be considered hard. Limitations need to be done so that the handset business doesn't become too much of a challenge for the player, as there are already challenges enough with the current features.

Currently handsets are out of the scope of MOB. But, if these are to be made as a new feature in MOB they need to be added in a way that doesn't change the dynamics and models behind the current version of MOB too much. A simple enough way needs to be found, both from the players' and developer's point of view.

The only decision that the players need to do, if handset subsidy is allowed, is the amount of subsidy for a specific handset. Another simplification is the division of the handsets into distinct categories. SIM-locks are used and the obligatory contract period when subsidies are applied is one season. During this time the subscriber can not end his subscription.

### 8.3.2 Solution

#### Decision Window

The decision window for the handset business can be seen from Figure 19. At the beginning handset subsidization is not allowed in MOB. As long as this is the case, the mobile operator is not part of the handset business in any way. However, this will change if and when the regulatory authority interferes by allowing handset subsidization in MOB. From now on the operator is able to influence what kind of handsets will be sold to its customers.

The handsets are divided into three categories: basic, middle and high. By heavily subsidizing high-end handsets, the operator can e.g. acquire more business users or heavy data users. By heavily subsidizing low-end devices the operator can again acquire e.g. those end-users that use their handsets only for voice services and SMS.

The only decision parameters in the handset decision window are for how much subsidy the teams are willing to offer for each category of mobile handsets. The handset decision window also consists of general information about the handsets, such as the price for each category of handsets and previous season values. There are also estimation boxes that allow the teams to estimate their total cost for handset subsidy.

Handsets						
Mobile handset sales						
Subsidization allowed	YES					
Mobile handset model	Basic		Middle		High	
	Season 1	Season 0	Season 1	Season 0	Season 1	Season 0
Price (€/handset)	109,00	110,00	224,00	230,00	476,00	490,00
Amount of subsidy offered (%)	15,00	20,00	20,00	25,00	40,00	40,00
Amount of subsidy offered (€)	16,35	22,00	44,80	57,50	190,40	196,00
Estimated sales (handsets)	250 000	240 000	135 000	150 000	50 000	55 000
Sales (handsets)		242 335		143 267		42 102
Estimated cost for the mobile operator (k€)	4 087,50	5 280,00	6 048,00	8 625,00	9 520,00	10 780,00
Cost for the mobile operator (k€)		5 331,37		8 237,85		8 251,99
	Total					
	Season 1	Season 0				
Estimated total cost for the mobile operator (k€)	19 655,50	24 685,00				
Total cost for the Mobile operator (k€)		21 821,21				

**Figure 19.** The handset business decision window in MOB.

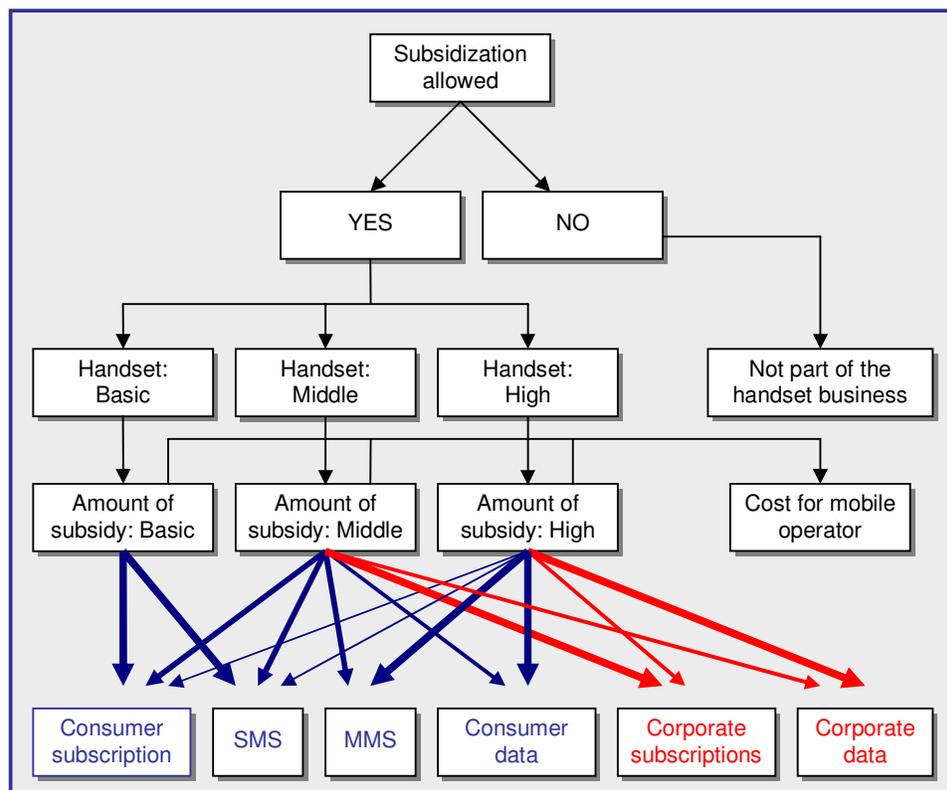
The strategic choice for the teams, in this model, is whether to give handset subsidies or not. In the real life the situation is quite different. The operators have the possibility to also decide on e.g. length of contracts, penalties for broken contracts, and the cost for unlocking SIM-locked handsets.

#### Dependencies

The dependencies that will be added are illustrated in Figure 20. Handset subsidization is either allowed or not. As long as it is not allowed the mobile operator in MOB is not part of the handset business in any way. But, as it

becomes allowed it will be part of the operators acquisition costs. The amount of subsidy that the teams want to offer for different handset categories depends on their overall strategy.

In Figure 20 the consumer services are colored blue and the corporate services red. The thickness of the arrows indicates the importance of each category compared to each service (consumer voice, SMS, MMS, consumer data, corporate voice, and corporate data). It can be observed that the basic handset is only meant for the basic services, i.e. voice and SMS, and its importance for these basic services is the biggest. The corporate customers are not at all interested in these phones. The high-end handsets are used both by consumer and corporate customers, but their importance for MMS and data is the biggest. The middle category handsets lie somewhere between the low-end and the high-end handsets and are important in the usage of all the mobile services.



**Figure 20.** The dependencies in MOB due to handset business.

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## Part IV

### 9 RELIABILITY AND VALIDITY ANALYSIS

The results of a study must demonstrate sufficient reliability and validity in order for the study to constitute a contribution to the research field. The results of a study must be reliable on two accounts. Firstly, one must be able to show that the source of data is reliable and secondly, it must also be shown that the used measures are reliable. In other words, the reliability is dependent on the referenced literature and the tools and methods that are used to reach the results. Reliability assesses the issue of the similarity of results provided by independent but comparable measures of the same object (Churchill & Iacobucci, 2002)

Validity refers to the degree to which a measurement instrument accurately measures the specific concept that it is supposed to measure. While reliability refers to the accuracy of a measurement instrument, validity is concerned with whether or not the measurement instrument measures the correct phenomenon. (Aaker et al., 2000)

The main validation process for MOB was conducted through the three test sessions during the course *S-38.041 Networking Business*, as described in chapter 4. The secondary process was mainly based on discussions between the author and members of the Networking Business team at TKK. The secondary validation process was mainly used for the new aspects that are to be implemented into MOB. Because these are not implemented into MOB yet, thorough testing for these was not possible. The final validation for the new modeled aspects remains for further study.

The test sessions were held to validate:

- If the improvements made to models in MOB are realistic;
- If MOB has become more user-friendly and playable;
- If MOB can be used as a teaching tool;
- If the aspects that are modeled in this thesis are needed;
- If MOB needs any major changes or other improvements.

The experiences from the test sessions, as described in chapter 4, were positive. Results indicate that MOB is now in a state where both the playability, user-friendliness, and how it models the real world is at a good level. As for MOB's suitability for teaching purposes, similar results that have been found by Töyli, were also observed for MOB (Töyli, 2001).

A game, or simulation, is valid to the degree that the learning objectives are achieved by the participants (Peters et al., 1998). One of the

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objectives for MOB is to offer a teaching tool for students at TKK. Table 9 indicates that MOB was able to fulfill this validation criterion. The average grade (4-10) for learning was 7,9.

Major part of the literature used in this study contributed for describing the new aspects that are modeled in this study. The literature study therefore gave a foundation upon which the actual models were built. The literature used in this study has been regarded as reliable.

The test sessions required much work, time and resources. Each session lasted for a whole working day and required a considerable amount of preparation work and results analysis. Hence, we were only able to arrange three test sessions adding up to 37 participants as a whole. This amount is in many cases not big enough to get reliable enough information and feedback. But, the feedback that was gained, in addition to the observations made by the author during the sessions, was extremely valuable. It gave a good picture about the current status and future needs of MOB.

The measures used for this research can be considered fairly reliable. The feedback form was a modification of the form Töyli has used for his business game sessions (Töyli, 2001). The participants in the test sessions consisted of both graduate and post graduate students. Hence, the range of participant knowledge level about the mobile operator business was between poor to good. This was a good audience considering the validation of the usability aspects of MOB.

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## 10 CONCLUSIONS

### 10.1 Results

The main results of this study are a working business game software and a learning process for the mobile operator business. The feedback that was gained during the test sessions indicated that the usability of the tool is now good enough for teaching purposes and even for commercial consultation. Shortly, the tool is now tested and found to be realistic.

As a result of this study the future usage of MOB can be divided into two categories:

- Pedagogically oriented;
- Research oriented.

The pedagogical power of MOB has been described already, and it is also easily explained and understood. Due to the good feedback, MOB will most likely be used more extensively in the future.

The linkage to research can be more difficult to understand. However, the linkage to research activities can be considered in the following way:

- MOB can be used as a delivery platform into which the most relevant results of mobile business research can be implemented.
- Another way would be to use MOB the other way round, i.e. that MOB would be able to give feedback and market information to independent projects. This would require much further work though, and be considered extremely difficult.

### 10.2 Recommendations for Further Study

The results of this study have invoked some issues and questions that could be considered interesting to pursue further. Suggestions for further research include:

- Stronger division between MNO and MSO parts of the mobile operator business;
- Structure of ARPU;
- Improvements to the human resource management part in MOB;
- Explicit division of subscribers into existing and new ones to enable specific marketing decisions and churn rate monitoring;
- Further improvements to:
  - Usability;
  - Documentation;

- Existing models.

It is important to remember to balance the decision-making and not make MOB too difficult to use. A business game needs simplifications to be able to model the real world in a sensible way, and hence, it can offer only some aspects of the reality. Adding too many decision parameters would only make the game more difficult to play, and the usability would suffer.

MOB is now in a state where it gives a superficial overall picture about the majority of the decisions a mobile operator needs to consider. The human resource aspect is already a part of MOB, but it is modeled and implemented in an extremely simple way. Some additions to the human resource part in MOB would not add complexity too much. The addition of churn rates and ARPU's into MOB would not either add to the complexity of the game.

However, the division between MNO and MSO parts of the mobile operator business, as for the division between existing and new subscribers, would add internal complexity considerably. The decision to add these two aspects needs to be analyzed thoroughly. This decision would not only add more complexity to the game, but also change the structure of MOB.

## 11 LIST OF REFERENCES

- Aaker, D. A. et al. (2000). *Marketing Research*, 7<sup>th</sup> ed., John Wiley & Sons, New York, ISBN 0-471-36340-5.
- A Week in Wireless (2004). Newsletter nr. 138 received by email.
- Cesim (2003). *Company Homepages*, [referred 28.05.2004] <<http://www.cesim.com>>.
- Churchill, A. G. & Iacobucci, D. (2002). *Marketing Research – Methodological Foundations*, 8<sup>th</sup> ed., South-Western, ISBN 0-03-033101-3.
- Daoud, F. & Hämmäinen, H. (2004). *Market Analysis of Mobile Handset Subsidies*, Helsinki University of Technology, ITS Conference, Berlin.
- Elisa (2004). *Company Homepages*, [referred 25.07.2004] <URL: <http://matkaviestinta.elisa.fi/public/elisa.do?lang=fi&side=1>>.
- Elektroniikan Tukkukauppiat ry (2004). *Association Homepages*, [referred 15.09.2004] <<http://www.etkry.com>>.
- Faria, A. J. (1987). *Survey of the Use of Business Games in Academia and Business*, *Simulation and Gaming* vol. 18:2.
- Faria, A. J., (1998). *Business Simulation Games: Current Usage Levels – An Update*, *Simulation and Gaming* vol. 29:3.
- FICORA (2004). *Authority Homepages*, [referred 04.05.2004], <<http://www.ficora.fi>>.
- Finnet Networks (2004). *Company Homepages*, [referred 25.07.2004] <<http://www.finnetverkot.fi/index.asp>>.
- GSM Association (2004). *Association Homepages*, [referred 24.05.2004 and 14.08.2004] <<http://www.gsmworld.com>>.
- Herald Tribune (2003). *There is no such thing as a free phone*, [referred 27.05.2004] <[http://www.iht.com/articles/2003/06/30/btphones\\_ed3\\_.html](http://www.iht.com/articles/2003/06/30/btphones_ed3_.html)>.
- Hämeen-Anttila, T. (2002). *Mobiilipalvelujen tuottaminen*, Docendo, Jyväskylä.
- Hämmäinen, H. (2003). *Referred from internal documents of Networking Laboratory*.
- In-Stat/MDR, (2004). *Growth Returns – Worldwide Mobile Subscriber Forecasts 2004-2009, Abstract*, [referred 14.08.2004] <<http://www.instat.com/Abstract.asp?ID=232&SKU=IN0401276GW>>.
- ITviikko, (2004). *Soneran mielestä 3g-verkko ei kelpaa vielä suomalaisille*, [referred 15.06.2004] <<http://www.itviikko.fi/uutiset/uutinen.asp?UutisID=61050>>.

- Juniper Research (2002). MMS: Content Strategies, [referred 15.05.2004] <[http://www.juniperresearch.com/pdfs/white\\_paper\\_3\\_mms\\_content\\_strategies.pdf](http://www.juniperresearch.com/pdfs/white_paper_3_mms_content_strategies.pdf)>.
- Keys, B. & Wolfe, J. (1990). The Role of Management Games and Simulations in Education and Research, *Journal of Management* vol. 16:2.
- Kiiski, A. & Kiiski, M. (2003). Content Game – The Challenge for Mobile Operators, Helsinki University of Technology, [referred 16.08.2004] <[http://www.netlab.hut.fi/opetus/s38042/s03/presentations/a\\_kiiski/content\\_game\\_presentation.pdf](http://www.netlab.hut.fi/opetus/s38042/s03/presentations/a_kiiski/content_game_presentation.pdf)>.
- Kiiski, A. & Hämmäinen, H. (2004). Mobile Virtual Network Operators: Case Finland, Helsinki University of Technology, ITS Conference, Berlin, [referred 26.09.2004] <[http://userpage.fu-berlin.de/~jmueller/its/conf/berlin04/Papers/Kiiski\\_paper.pdf](http://userpage.fu-berlin.de/~jmueller/its/conf/berlin04/Papers/Kiiski_paper.pdf)>.
- Kivisaari, E. & Luukkainen, S. (2003). Content-based Pricing of Services in the Mobile Internet, IMSA Conference, Honolulu.
- Kokko, J. (2004). Mobile Operator Business Game, Master's Thesis, Helsinki University of Technology.
- Kohonen, V. (2004). The Current Competitive Situation of the Finnish Mobile Services Marketplace, Helsinki University of Technology, [referred 14.04.2004] <[www.tml.hut.fi/Opinnot/T-109.551/2004/reports/Marketplace\\_v2.doc](http://www.tml.hut.fi/Opinnot/T-109.551/2004/reports/Marketplace_v2.doc)>.
- Kristensson, S. & Gahnström, A. (2001). Mobile Virtual Network Operators – Assessing MVNO Business Opportunities, Master's Thesis, University of Stockholm.
- Lane, C. (1995). On a Resurgence of Management Simulations and Games, *Journal of the Operational Research Society* vol. 46:5.
- Lillehagen A. et al. (2001). An Analysis of the MVNO Business Model, *Elektronikk* vol. 4.2001.
- Mintc (2002). Finnish Telecom Policy, [referred 12.04.2004] <[http://www.mintc.fi/oliver/upl575-Finnish\\_Telecom\\_Policy\\_-julkaisu.pdf](http://www.mintc.fi/oliver/upl575-Finnish_Telecom_Policy_-julkaisu.pdf)>.
- Mintc (2003). Communications Market Act, Issued in Helsinki on 23 May 2003, <[http://www.mintc.fi/www/sivut/dokumentit/viestinta/tavoite/communications\\_market\\_act.pdf](http://www.mintc.fi/www/sivut/dokumentit/viestinta/tavoite/communications_market_act.pdf)>.
- Mintc (2004a). Mobiilipalvelumarkkinat Suomessa 2003, [referred 27.08.2004] <[http://www.mintc.fi/oliver/upl545-24\\_2004.pdf](http://www.mintc.fi/oliver/upl545-24_2004.pdf)>.
- Mintc (2004b). Ministry of Transport and Communications Homepages, [referred 30.06.2004] <<http://www.mintc.fi>>.

- Mobiledia (2004). Web-site, [referred 08.10.2004]  
<<http://www.mobiledia.com/glossary/>>.
- Netsize (2003). European SMS Guide, [referred 20.06.2004]  
<[http://www.juniperresearch.com/pdfs/white\\_paper\\_4\\_sms.pdf](http://www.juniperresearch.com/pdfs/white_paper_4_sms.pdf)>.
- Nieminen, K. (2003). An Analysis of Radiolinja's Strategy, Helsinki University of Technology, [referred 14.04.2004]  
<[http://www.netlab.hut.fi/opetus/s38042/s03/presentations/k\\_nieminen/Radiolinja-Strategy.pdf](http://www.netlab.hut.fi/opetus/s38042/s03/presentations/k_nieminen/Radiolinja-Strategy.pdf)>.
- Nokia (2004). Press Release: Nokia Finds "Out and About" Consumers Will Pay More for Mobile Content, [referred 10.08.2004]  
<[http://press.nokia.com/PR/200404/943441\\_5.html](http://press.nokia.com/PR/200404/943441_5.html)>.
- Numpac (2004). Company Homepages, [referred 01.04.2004]  
<<http://www.numpac.fi/index.php?site=125>>
- Paavilainen, J. (2002). Mobile Business Strategies: Understanding the Technologies and Opportunities, 1<sup>st</sup> ed., Addison-Wesley Professional, ISBN 0201788985.
- Peters, V. et al. (1998). The Validity of Games, Simulation & Gaming vol. 29:1.
- Pohjola, O-P et al. (2004). Roaming Dynamics in GPRS and Beyond: Options and Strategies, Networks2004 Conference, Vienna, [referred 23.12.2004]  
<<http://www.netlab.hut.fi/~renjish/networks2004.pdf>>.
- Ralph, D. & Graham, P. (2003). MMS: Technologies, Usage and Business Models, John Wiley, England, ISBN 0-470-86116-9.
- Tee, R. (2003). Contextualizing the Mobile Internet, Master's Thesis, University of Amsterdam.
- TeliaSonera (2004). Company Homepages, [referred 25.07.2004] <URL: <http://www.sonera.fi>>.
- Tietoviikko (2004). Mobiilidata huipussaän Filippiineillä, [01.04.2004]  
<[http://www.digitoday.fi/showPage.php?page\\_id=12&news\\_id=2973](http://www.digitoday.fi/showPage.php?page_id=12&news_id=2973)>.
- Töyli, J. (2001). A Generic Business Management Simulation for Graduate Student and Managerial Training, Doctoral Thesis, Turku School of Economics and Business Administration.
- Töyli, J. et al. (2004). A Learning Environment for Business Education, (in proceedings of IFIP WG 5.7 SIG workshop).
- Schiller, J. H. (2003). Mobile Communications, 2<sup>nd</sup> ed., Addison-Wesley, London, ISBN 0-321-12381-6.

- Simobiz, (2003). Business Game – Mobile Telecom Markets, [referred 14.08.2004]  
<[www.netlab.hut.fi/opetus/s38042/s03/presentations/simobiz/Presentation%20Engl-UIT.ppt](http://www.netlab.hut.fi/opetus/s38042/s03/presentations/simobiz/Presentation%20Engl-UIT.ppt)>
- Van Thanh (2001). The Mobile Virtual Network Operator Concept: Truth and Myths, *Telektronikk* vol. 4.2001.
- Ålands mobiletelefon (2004). Homepages, [referred 25.07.2004]  
<<http://www.gsm.aland.fi>>.

## **Appendix 1**

### **Player instructions for MOB**



HELSINKI UNIVERSITY OF TECHNOLOGY  
DEPARTMENT OF ELECTRICAL AND COMMUNICATIONS ENGINEERING  
NETWORKING LABORATORY

## **PLAYER INSTRUCTIONS**

**VERSION 1.0**

**04.04.2004**

MOBILE OPERATOR BUSINESS GAME

MOB

# 1. Introduction

## 1.1 Generally About Business Games

Active and problem-based learning has increased its popularity rapidly. This is mainly due to some new ideas on how people actually learn (Töyli, 2001). Business games as a mean of learning, promote the idea of “learning by doing”, and they have become very popular and important teaching tools. In this player instruction report, the terms simulation (or teaching simulation) and business game are considered as synonyms.

The following Chinese proverb highlights the philosophy behind simulations and business games quite well: (Töyli 2001)

*I hear and I forget*  
*I see and I remember*  
*I do and I understand*

It can be stated that a simulation is a media to provide “learning by experiment” and “learning by doing”. In traditional teaching, students are passive recipients of information and are not assumed to contribute to the learning of each other. Simulations (business games) are, on the contrary, learner-directed: a situation or a problem is presented to the participants and they are encouraged to find a solution. Because of the nature of a business game, the views of many people are more easily considered. (Töyli, 2001)

In 1987 it was estimated that over 8755 instructors in over 1900 four-year business schools used simulations/games in their course work (Töyli, 2001 and Faria, 1987). In 1998 an update to the year 1987 study was made. The results of the update showed that usage of business games had increased in all fields studied (Töyli, 2001 and Faria, 1998).

The purpose of a business game is to provide students a summarizing overview of various subjects they have studied in the past. The key learning experience is seeing and applying many different theories in different fields and observing their linkages. The theories must be applied on somewhat superficial level in order to be able to give the summarizing learning experience with wide scope. (Kokko, 2004)

## 1.2 MOB Overview

The main objective of the Mobile Operator Business Game (MOB) is to familiarize the participants with today’s mobile operator business, especially the Finnish one, and to gain a better understanding of it. Main emphasis is placed on customer-focused business thinking. It needs to be remembered

that MOB can not exactly model the mobile communications market, but it can hopefully mirror some events and phenomenon that might occur in it. MOB can, if thoroughly implemented, for example:

- Be used to analyze business constraints, dependencies, and possible futures of the mobile communications market;
- Help to gain better understanding of the mobile communications businesses;
- Improve teamwork skills;
- Be fun.

The teams' tasks in MOB are to price and promote various types of mobile services, e.g. consumer voice and corporate voice, SMS, MMS, cellular data, and WLAN data, and to make different kinds of necessary investments. Different kinds of investments are investments on e.g. marketing, customer acquisition and relations, human resource management, and research and development. All of these play an important role in the MOB-model. At this point of development the MOB-model models the teams as both network and service operators.

This chapter outlines the functionality of the Mobile operator business game from both the players' point of view and the facilitator's point of view. The facilitator is the person who runs the game session, the facilitator could also be thought of as the market power.

### **1.2.1 PARTICIPANTS' ROLES IN MOB**

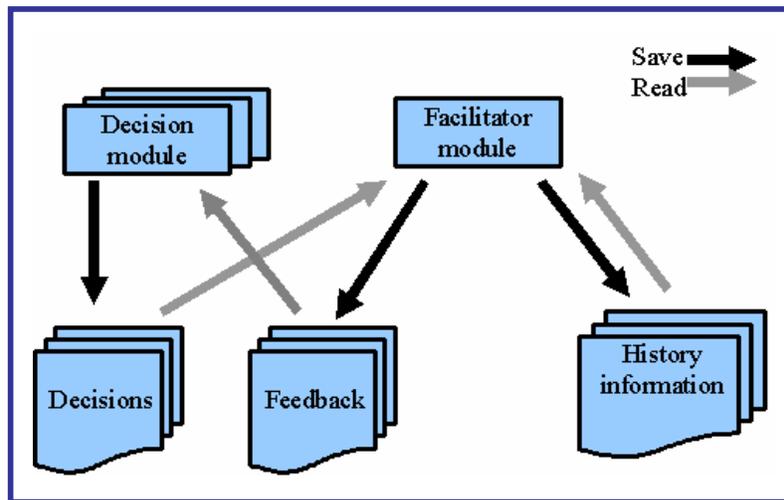
In MOB two to six teams can compete against each other. Each team represents a management board of a mobile operator. One game session is a sequence of seasons. One season equals one year. The maximum number of seasons is nine and the starting season is denoted as season 0. For each season teams make various decisions concerning: pricing of services, marketing, research and development, network maintenance, purchasing and human relationship management. These decisions are placed on excel sheets and delivered to the facilitator. At the beginning of each season the facilitator delivers a new market situation to the players and elaborates the new market situation verbally.

### **1.2.2 Structure of MOB**

MOB is made out of two excel workbooks which are called "the player module" and "the facilitator module". Each team gets its own player module. Usually all the player modules are identical in the beginning of a session. This enables games with identical starting setting for all teams, but also more realistic settings where there is a market leader and challengers of different strengths. The facilitator module generates new market situations based on the teams'

decisions. Generation of market situations is highly automated. However, if necessary, the facilitator can intervene to the parameterisation of the game. He can also manipulate teams' decisions if necessary. Manipulation of results is of course recommended only in the case of clear unintentional input.

The information between the player modules and the facilitator module is transferred in text files. The structure and interaction between the different modules is illustrated in figure 1.



**Figure 1:** The structure of MOB and the information flows between the different modules.

In these player instructions only the structure of the player module will be described in more detail. The structure of the facilitator module will be described only very shortly.

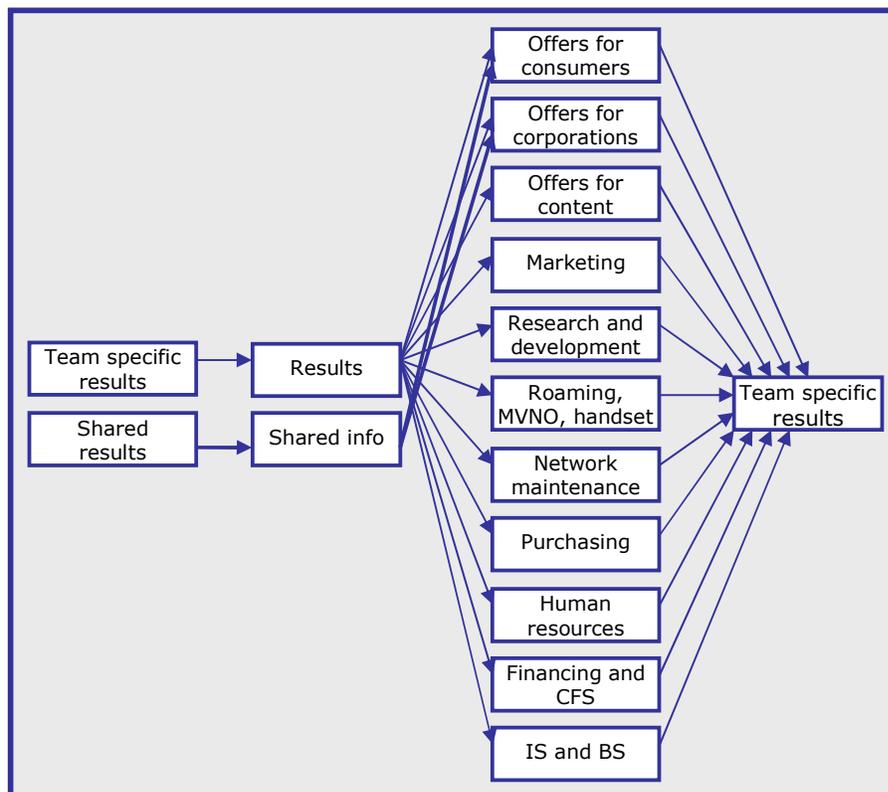
### 1.2.3 The Structure of the Player Module

The decision making in the player module is distributed in the following manner:

- Offers for consumers;
  - Voice services;
  - Data services;
  - Messaging services.
- Offers for corporations;
- Offers for content providers (Not implemented yet!);
- Marketing;
- Research and development;
- Roaming, MVNO, and handsets (Not implemented yet!);
- Network maintenance;

- Purchasing;
- Human resources;
- Financing and cash flow statement (CFS);
- Income statement (IS) and balance sheet (BS).

Information directly related to the decision making is shown in the same window as the where the decisions are made. Teams can start the decision making from any of the decision parameters, but it could be easier to follow some kind of a predefined pattern, e.g. by going through the decisions in the same order as the buttons on each window (more on these in chapter 2). In addition to the decision making windows, the player module has separate windows for financial information, such as the income statement and the balance sheet, and a main window. The main window is where the decisions are saved and sent to the facilitator and the new generated market situations are retrieved. Figure 2 illustrates the data flow in the player module. Detailed information about the player module can be found in chapter 2.



**Figure 2:** The data flow in the player module.

#### 1.2.4 The Structure of the Facilitator Module

The generation of the new market situation in the facilitator module begins by reading in the decisions of all teams. The calculation of the new market situation is distributed in the same manner that the decision making is

distributed in player module as showed in figure 2. The majority of the calculations give two basic results, the first is an index telling the success of the players' actions on a particular area, and the second is the cost incurred from the decisions.

### 1.2.5 Modeled Sub Games

MOB includes many different sub games which all are somewhat related to each other, but can be handled as separate entities. Decision-making regarding these sub games is in a more strategic level and can not be directly mapped to any decision fields. Teams should before the game session make a strategic business plan regarding the sub games. It is important that the teams have at least an initial idea to which direction they are going. The sub games are:

- Demand – supply balancing game;
- Cellular radio game (WCDMA vs. EDGE);
- Multi-radio game (cellular data vs. WLAN data);
- Pricing game (flat rate vs. usage based vs. block pricing);
- Charging game (prepaid vs. postpaid);
- Messaging game (SMS vs. MMS);
- Roaming game (bilateral vs. clustered) (Not implemented yet!);
- Mobile content game (operator charging vs. bit pipe) (Not implemented yet!);
- Handset and MVNO games (Not implemented yet!).

The ***Demand-supply balancing game*** is the top-level game. The teams see some indications of demand of the services they are selling and they must try to supply to this demand. Essential elements of this type of game are the estimation of demand and relevant preparations for equipment capacity.

The ***Cellular radio game*** is a technology sub game. Teams must fulfill the emerging need for more capacity in cellular data services by developing knowledge and purchasing equipment of third generation radio access and trunk technologies. Two possibilities for third generation access networks are presented in MOB, the first is EDGE and the second is WCDMA.

The ***Multi-radio game*** is other type of radio technology game. Cellular radio technologies are challenged by other emerging technologies. In this version of MOB only WLAN is included. Teams must ponder the positioning on WLAN technologies. Will WLAN be a strong competitor of cellular technologies or will its role be more of a contributing extension of cellular technologies for bandwidth intensive services?

In the **Pricing game** teams have to decide on their pricing schemes. For simplicity, different pricing schemes are available only in the pricing of consumer data services. Players can choose between usage based pricing, flat rate pricing and a sort of block pricing (more on this in chapter 2). The basic assumption in this sub game is that consumers do not like meters and there for prefer flat rate. Flat rate on the other hand is not appealing choice for the operators because with flat rate pricing it is very difficult to predict the overall transmitted traffic.

The **Charging game** deals with timing of charging. There are two charging schemes for consumer customers: prepaid and postpaid. Prepaid charging has had significant importance in many countries in increasing the cellular penetration rate when saturation of postpaid users has started to emerge. Prepaid has traditionally been an attempt to get the less profitable customers. Customers belonging to this segment can for example be customers that aren't credit worthy. If a customer isn't credit worthy it does not necessarily mean that he is a bad customer. For example young people fall into category of non-credit worthy and still they are seen as a very important customer group.

The same kinds of assumptions can be made for the other sub games that were mentioned (messaging game, roaming game etc.).

### **1.2.6 Demand in MOB**

Demands for different services follow the commonly known market life cycles (Kotler, 1997). A separate life cycle curve is defined for each offered service: i.e. pre- and postpaid voice, cellular data, WLAN data, SMS and MMS.

Demand is defined in three levels. First there is the population of the imaginary country. Usually during a game session growth of population is small and linear. Second level is the number of voice subscriptions (pre- and postpaid). The life cycle of these subscriptions is essentially the same as the life cycle of mobile communications, which within the scope of the game is always either in growth stage or maturity stage. On the third level there are the market life cycles of other services that are handled as additions to the voice subscription. The upper levels can be seen as the upper bounds of demand. Number of subscriptions cannot radically exceed the number of population and subscribers of a particular service cannot exceed the number of subscriptions.

Market life cycles are implemented in two different ways. First there are the static life cycle curves that are defined by the facilitator before a game session. These curves are defined by giving them an initial demand value for season 0 and then giving them growth rates for each season. The facilitator can manually adjust the growth rates during the game if needed.

Static demand curves are used for services that have already been introduced and are in commercial use at the beginning of the game. These demand curves do not have any technological obstacles that players have to tackle before the service can be offered in its full capacity either. These services are prepaid and postpaid voice, GPRS, SMS, and MMS.

On the other hand there are services that are not in commercial use at the beginning of the game and are dependent of the technological choices of the participants. For example data services via EDGE or WCDMA networks enable a much richer service portfolio than data services via the GSM/GPRS network. For these kinds of services static demand curves are not desirable. Participants' actions have an impact on the demand and it must be shown. A more dynamic approach is used for such services. The dynamic demand curves are calculated separately for every season. Services with dynamic demand curves are EDGE, UMTS, and WLAN.

## 2. The Player Module in MOB

The windows where the teams put their decisions are explained in this chapter. All the decisions that are needed to play MOB will be described shortly. This chapter is largely based on the Master's Thesis by J. Kokko (Kokko, 2004).

The white cells in MOB are for actual decisions, the gray cells for estimations, and the others for automated revenue calculations, previous years' values, and other information. The estimation cells makes it possible to make what if analysis and to make estimations for next years cash flow and income statements, and balance sheets.

Every window has the same buttons at the top of the page. These buttons are:

- The Main –button;
- The Offers for Consumers –button;
- The Offers for Corporations –button;
- The Offers for Content Providers –button;
- The Marketing –button;
- The Research and Development –button;
- The Roaming, MVNO, & Handsets –button;
- The Network Maintenance –button;
- The Purchasing –button;
- The Human Resources –button;
- The Financing & Cash Flow Statement –button;
- The Income Statement & Balance Sheet –button.

Every one of these buttons represents a window in MOB. Some of these buttons may have sub buttons if the window is divided in several sub windows.

### *2.1 The Main Window*

The main window has only two functions for the players. To get the new results generated by the facilitator between each season, and to save and send the decisions made by the teams to the facilitator. The main window also shows the name of the team, the team number, and the current season. The main window can be seen in figure 3.

<b>Main</b>	Offers for Consumers	Offers for Corporations	Offers for Content Providers	Marketing	Research and Development
Roaming, MVNO, & Handsets	Network Maintenance	Purchasing	Human Resources	Financing & Cash Flow Statement	Income Statement & Balance Sheet
<b>Management Information System</b>					
Name of Team:	<b>Team</b>	<input type="button" value="Edit"/>	<input type="button" value="Get new results"/>		
Team Number:	<b>1</b>		<input type="button" value="Save and send decisions"/>		
Season:	<b>1</b>				

**Figure 3:** The Main window of MOB.

## 2.2 The Offers for Consumers Window

### 2.2.1 Voice Services

Voice traffic is priced in the same manner that mobile operators have traditionally priced it. All teams will have the same pricing scheme. It is recommended that teams examine carefully their cost structure and estimate some kind of value for the lowest prices they can offer and still be profitable. Teams should also estimate the highest prices the customers are willing to pay. As in real life neither of these values is likely to be same between any two groups of players.

From figure 4 it can be seen that the values in dark blue are values from the previous season. This information is important when making new decisions and estimating possible revenues for the season to come.

Main	<b>Offers for Consumers</b>	Offers for Corporations	Offers for Content Providers	Marketing	Research and Development
Roaming, MVNO, & Handsets	Network Maintenance	Purchasing	Human Resources	Financing & Cash Flow Statement	Income Statement & Balance Sheet
<b>Voice Services</b>	Data Services	Messaging Services			
<b>Offers for Consumers</b>					
<b>Postpaid subscription</b>			<b>Prepaid subscription</b>		<b>Graphs</b>
Nr. of postpaid subs	Season 1	Season 0	Nr. of prepaid subs	Season 1	Season 0
Opening charge:		465 500	Opening charge:		24 500
Monthly charge:		3,90			10,00
Calls (€/min):					
07:00-17:00		0,18	07:00-17:00		0,25
Other		0,14	Other		0,20
Roaming		0,00	Roaming		0,00
Average min/subs/year: 07:00-17:00		815,00	Average min/subs/year: 07:00-17:00		815,00
Average min/subs/year: other		815,00	Average min/subs/year: other		815,00
Estimated nr. of postpaid subs			Estimated nr. of prepaid subs		
Estimated average min/subs/year: 07:00-17:00			Estimated average min/subs/year: 07:00-17:00		
Estimated average min/subs/year: other			Estimated average min/subs/year: other		
Revenues (k€)		143 337	Revenues (k€)		8 998
Estimated revenues (k€)		0	Estimated revenues (k€)		0

**Figure 4:** The Offers for Consumers: Voice Services window in MOB.

### 2.2.2 Data Services

In data services teams have an additional opportunity to differentiate and compete with the actual pricing scheme (pricing type). The teams have three choices to choose from. Each of these choices has their own pros and cons. The first alternative is usage-based pricing, which is basically identical to the pricing scheme used for voice traffic. With this scheme traffic is measured constantly. Second pricing scheme is flat rate pricing. In this scheme customers pay a monthly fee, which gives them permission to use as much network resources as they choose. If the team chooses this pricing scheme it should be prepared for careless usage of network resources. The third pricing

scheme is sort of a block pricing scheme. This is a combination of usage-based pricing and flat rate pricing. The idea is that a customer pays a monthly fee for a block of data and if he uses more he also pays usage-based fee for every additional data unit (compare to the GPRS pricing schemes of today's mobile operators).

The offers are divided into cellular data and WLAN data. Cellular data means GPRS, EDGE, and/ or UMTS. The pricing schemes are the same for both, i.e. if the player chooses flat rate, both cellular and WLAN data uses flat rate. From figure 5, the offers for consumer data services can be seen.

Main	<b>Offers for Consumers</b>	Offers for Corporations	Offers for Content Providers	Marketing	Research and Development
Roaming, MVNO, & Handsets	Network Maintenance	Purchasing	Human Resources	Financing & Cash Flow Statement	Income Statement & Balance Sheet
Voice Services	<b>Data Services</b>	Messaging Services			
<b>Offers for Consumers</b>					
<b>Data services</b>				<b>Graphs</b>	
	<b>Cellular</b>		<b>WLAN</b>		
	<b>Season 1</b>	<b>Season 0</b>	<b>Season 1</b>	<b>Season 0</b>	
Monthly payment: (€/month)		5,00		0,00	
Price of 1 MB (€/MB)		4,00		0,00	
Block size (MB)					
Roaming surcharge		0,00		0,00	
Nr. of data users		5 000		0	
Average MB/user/month		2,00		0,00	
Estimated nr. of data users					
Estimated average MB/user/month					
Revenues (k€)		780		0	
Estimated revenues (k€)		0		0	
					<b>Pricing type</b>
					<b>Season 1</b> <b>Season 0</b>
					Usage Usage
					<b>Choose pricing type</b>
					Flat rate
					Usage based
					Block price
					Cellular data users
					WLAN data users
					Cellular data ARPU
					WLAN data ARPU

**Figure 5:** The Offers for Consumers: Data Services window in MOB.

### 2.2.3 Messaging Services

The last consumer related pricing decisions are for pricing messaging services. Players have to set prices for SMS and MMS messages. SMS market is considered to be a mature market. MMS on the other hand is a growing market where demand starts from zero and gradually grows during the game. MMS might partly satisfy the same needs as SMS. As demand for MMS grows there is likely to be a decline in the demand of SMS, though MMS will never fully replace SMS. The offers for consumer massaging services can be seen from figure 6.

Main	<b>Offers for Consumers</b>	Offers for Corporations	Offers for Content Providers	Marketing	Research and Development
Roaming, MVNO, & Handsets	Network Maintenance	Purchasing	Human Resources	Financing & Cash Flow Statement	Income Statement & Balance Sheet
Voice Services	Data Services	<b>Messaging Services</b>			
<b>Offers for Consumers</b>					
<b>Person to person services</b>				<b>Graphs</b>	
	<b>Home</b>		<b>Roaming</b>		
	<b>Season 1</b>	<b>Season 0</b>	<b>Season 1</b>	<b>Season 0</b>	
SMS (€/message)		0,17		0,00	SMS users
MMS (€/message)		0,55		0,00	MMS users
Nr. of SMS users		466 667		0	SMS ARPU
Nr. of MMS users		5 000		0	MMS ARPU
Nr. of SMS's/user/month		26		0	
Nr. of MMS's/user/month		4		0	
Estimated nr. of SMS users					
Estimated nr. of MMS users					
Estimated nr. of SMS's/user/month					
Estimated nr. of MMS's/user/month					
SMS revenues (k€)		26 656		0	
MMS revenues (k€)		132		0	
Estimated SMS revenues (k€)	0		0		
Estimated MMS revenues (k€)	0		0		

**Figure 6:** The Offers for Consumers: Messaging Services window in MOB.

### 2.3 The Offers for Corporations Window

The corporate customers are divided into three segments according to their size. The segments are: small and medium sized enterprises (SME), national corporations (NAT) and international corporations (INT). An additional fourth segment is the public administration (PA). Decisions concerning public administration are the same as in corporate segments but the pricing rules are different. Generally profits in public administration are smaller than in corporate segments.

Teams can make offers to each of the previously mentioned segments. For simplicity, offers are made as monthly flat rate charge per person. Following segment specific information helps in decision-making:

- Average number of personnel;
- Number of corporations;
- Previous average monthly call minutes per user;
- Previous average monthly data traffic (MB) per user

The Offers for Corporations window is shown in figure 7. The resource usage of each segment can be calculated from average number of personnel, number of current customers, estimations of new customers and estimated average monthly call minutes/data traffic per user. From resource usage the teams can calculate the cost of these customers. This information can be used as the minimum price offer. For the actual offer teams have to consider the general price level between all competitors and their investment on customer relationships. If teams have invested enough in customer relationship in the long term, customers might see their offer more valuable than a cheaper offer by some competitor who has not invested in customer relationship. Investment in customer relationship is the equivalent of marketing investment on the consumer side. In corporate side the marketing is done

individually to each customer. In addition to previous decisions teams can try to acquire new customers. The acquisition of a new customer is approximately

Main	Offers for Consumers	Offers for Corporations	Offers for Content Providers	Marketing	Research and Development
Roaming, MVNO, & Handsets	Network Maintenance	Purchasing	Human Resources	Financing & Cash Flow Statement	Income Statement & Balance Sheet
<b>Offers for Corporations</b>					
		<b>SMEs</b>	<b>National corporations</b>	<b>International corporations</b>	<b>Public administration</b>
<b>Corporations</b>					
Average number of personnel:		14	120	950	1 200
Number of corporations:		29 200	2 230	555	450
Previous average monthly call minutes per user:		230,00	240,00	250,00	185,00
Previous average monthly data traffic (MB) per user:		30,00	50,00	100,00	8,00
<b>Offers</b>					
Flat rate offer for voice (€/month/user):					
Previous flat rate offer for voice (€/month/user):		40,00	40,00	35,00	35,00
Flat rate offer for data (€/month/user):					
Previous flat rate offer for data (€/month/user):		20,00	30,00	20,00	25,00
<b>Corporate customers</b>					
Number of current voice subscribers:		52 500	52 500	52 500	52 500
Estimated number of voice subscribers for next season:					
Number of current data subscribers:		438	438	438	438
Estimated number of data subscribers for next season:					
<b>Customer relationships</b>					
Previous investment on customer relationships (k€):		380,00	2 000,00	2 000,00	250,00
Next investment on customer relationships (k€):					
<b>Customer acquisition</b>					
Previous investment on customer acquisition (k€):		1 500,00	500,00	500,00	1 000,00
Next investment on customer acquisition (k€):					
<b>Revenues</b>					
Revenues for previous season (k€):		52 500	52 500	52 500	52 500
Estimated revenues for next season (k€):		0	0	0	0
<b>Competitors' offers</b>					
SMEs					
National corporations					
International corporations					
Public administration					
<b>Graphs</b>					
Voice offers					
Data offers					
Number of voice subscribers					
Number of data subscribers					
Customer relationship investments					
Customer acquisition investments					

five times more expensive than retaining an old one.

**Figure 7:** The Offers for Corporations window in MOB.

From the Offers for Corporations window, the teams can directly see both the estimated revenues from the corporate segments and the direct expenses of corporate deals. Indirect corporate expenses such as personnel, equipment and administrative expenses are considered elsewhere. Players should be efficient in their investments. Too small investments will not produce the wanted revenue and thus can be considered as wasted capital. Too large investments will not produce any more revenues than investments of the right size, and again money is wasted. Last thing that should be kept in mind is that customer relationship management is a continuous long-term investment.

## 2.4 The Offers for Content Providers Window

Currently not implemented in MOB!

## 2.5 The Marketing Window

Marketing decisions are divided into three different service categories: voice, data and content (content not implemented yet!). The decisions are made using a top down approach. First teams decide the size of their marketing budget. Then the budget is divided between the service categories. When each service category has its part of the whole budget the marketing messages are targeted. The Marketing window can be seen in figure 8.

Main	Offers for Consumers	Offers for Corporations	Offers for Content Providers	Marketing	Research and Development																																																																													
Roaming, MVNO, & Handsets	Network Maintenance	Purchasing	Human Resources	Financing & Cash Flow Statement	Income Statement & Balance Sheet																																																																													
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**Figure 8: The Marketing window in MOB.**

The consumer customers are divided into four segments and all the segments have their own characteristics and sizes. The segments and their sizes as a percentage of the whole consumer customer population are presented in the following list:

- Innovators 2.5%;
- Early adopters 13.5%;
- Maturity 68%;
- Laggards 16%.

## 2.6 The Research and Development Window

In the Research and Development window (figure 9) teams must make decisions regarding their research and development investments on different technologies. Only radio access technologies and application and service platforms are included in the currently version of MOB. Teams must decide the technologies they will invest in and how they will distribute their investments. The investments can be distributed into three segments; research, standardization, and testing.

The research segment will raise operator's knowledge level about a certain technology. This will improve operator's competence to operate the technology. Investments into the testing segment will ensure the quality of service. Investing into the standardization segment is a common effort of all teams in the game. None of the new technologies can be taken into use before enough is invested into standardization. When enough investments are made into a certain technology, that technology is considered to be mature enough to be taken into use. When this happens all teams that have enough knowledge to operate the new technology can start buying the equipment and offering the services enabled by that technology.

The research and development info indexes need to reach a level of 1 to enable the teams to use a certain technology. The levels are from 1 to 3. A level of 1 equals good knowledge, a level of 2 equals very good knowledge, and a level of 3 equals superior knowledge. The higher the level, the more competitive is the team. To reach a level of 1 can be fairly easy, but reaching higher levels requires much more investments.

Main	Offers for Consumers	Offers for Corporations	Offers for Content Providers	Marketing	Research and Development					
Roaming, MVNO, & Handsets	Network Maintenance	Purchasing	Human Resources	Financing & Cash Flow Statement	Income Statement & Balance Sheet					
<b>Research and Development</b>										
<b>Research and Development</b>										
Technologies:	Investment (k€)		Research (%)		Testing (%)		Standardisation (%)			
	Season 1	Season 0	Season 1	Season 0	Season 1	Season 0	Season 1	Season 0		
GSM	80 000		40	40	30	30	30	30	OK	
GPRS	20 000		40	40	30	30	30	30	OK	
EDGE	0		40	0	30	0	30	0	OK	
WCDMA	0		35	0	35	0	30	0	OK	
WLAN	0		35	0	35	0	30	0	OK	
Application & service platforms	5 000		30	40	30	30	40	30	OK	
<b>Research and Development Info</b>										
Season	0	1	2	3	4	5	6	7	8	9
GSM	2									
GPRS	1									
EDGE	0									
WCDMA	0									
WLAN	0									
Application & service platforms	1									
<b>Graphs: Investments on R&amp;D</b>										
Investment on GSM	Investment on GPRS	Investment on EDGE	Investment on WCDMA	Investment on WLAN	Investment on application & serv.					

**Figure 9:** The Research and Development window in MOB.

## 2.7 The Roaming, MVNO, and Handsets Window

### 2.7.1 Roaming

Currently not implemented in MOB!

### 2.7.2 MVNO

Currently not implemented in MOB!

### 2.7.3 Handsets

Currently not implemented in MOB!

## 2.8 The Network Maintenance Window

The network maintenance window is as much an information window, as it is a decision window. Here players can see the capacity, general condition and usage-level of their network equipment (figure 10). The Network Maintenance window divides the network equipment into three logical entities: access networks, core networks, and supplementary equipment. This kind of division is derived from 3GPP specifications (3GPP specifications; Nokia home pages).

Main	Offers for Consumers	Offers for Corporations	Offers for Content Providers	Marketing	Research and Development	
Roaming, MVNO, & Handsets	<b>Network Maintenance</b>	Purchasing	Human Resources	Financing & Cash Flow Statement	Income Statement & Balance Sheet	
<b>Network Maintenance</b>						
<b>Access networks</b>				<b>Season 0</b>	<b>Season 1</b>	<b>Graphs</b>
	<b>National coverage (%)</b>	<b>Capacity (simult. users)</b>	<b>General condition (%)</b>	<b>Usage-level (%)</b>	<b>Investment on maint. (k€)</b>	<b>Investment on maint. (k€)</b>
<b>Equipment</b>						
GSM	NW	600 000	95,00	70,00	500	
GPRS	NW	3 000	95,00	70,00	200	
EDGE	NW	0	0,00	0,00	0	
WCDMA	NW	0	0,00	0,00	0	
WLAN (public indoor)	NW	0	0,00	0,00	0	
						Previous investments on GSM/GPRS
						Previous investments on EDGE
						Previous investments on WCDMA
						Previous investments on WLAN
<b>Core network</b>				<b>Season 0</b>	<b>Season 1</b>	<b>Graphs</b>
		<b>Capacity (simult. users)</b>	<b>General condition (%)</b>	<b>Usage-level (%)</b>	<b>Investment on maint. (k€)</b>	<b>Investment on maint. (k€)</b>
<b>Equipment</b>						
CS core		600 000	95,00	70,00	500	
PS core		3 000	95,00	70,00	200	
						Previous investments on CS core
						Previous investments on PS core
<b>Supplementary equipment</b>				<b>Season 0</b>	<b>Season 1</b>	<b>Graphs</b>
		<b>Capacity (simult. users)</b>	<b>General condition (%)</b>	<b>Usage-level (%)</b>	<b>Investment on maint. (k€)</b>	<b>Investment on maint. (k€)</b>
<b>Equipment</b>						
Middleware & service platforms		500 000	95,00	70,00	100	
Billing and charging systems		600 000	95,00	70,00	100	
HLR (# of subscribers)		2 500 000	95,00	70,00	100	
						Previous investments on Middleware & serv.
						Previous investments on billing and char.
						Previous investments on HLR
<b>Development of quality indexes</b>						
<b>Season</b>		0	1	2	3	4
Voice		1,1				
Data		1,1				
Messaging		1,1				
<b>Season</b>		5	6	7	8	9
Voice						
Data						
Messaging						

**Figure 10:** The Network Maintenance window in MOB.

The decisions players have to make in this window are related to the general condition of the network equipment. Players need to decide the financial effort that they will invest on maintenance of the equipment. When new technologies and services are taken in use, the network equipment experiences a shake down period before the new service or technology is working properly. This period lasts roughly one season and during this time the usage level of the network should get very high. A good rule of thumb is that a good usage-level is about 70% of the theoretical maximum. If maintenance is done properly the fault conditions of the network are kept at minimum.

The general condition of network elements and usage-levels tell the level of quality delivered to customers. If customers receive services with poor quality they are willing to pay less for the service and they are also more willing to change to another operator.

In addition to maintenance information, the Network Maintenance window gives information for needed purchase decisions. Teams should always watch that the capacities of their network equipment are sufficient to serve all their customers.

## 2.9 The Purchasing Window

The equipment that is needed for delivering services is purchased through the purchasing window. An important issue regarding the purchasing decisions is the estimation of future capacities and the timing of the purchases. The role of

purchasing and also maintenance decisions is emphasized when new technologies are acquired for the first time. Thus special attention should be given to purchasing and maintenance decisions in the introduction stage of new services. In the introduction stage sales grow slowly. Possible reasons might be (Buzzell, 1956):

- Delays in expansion of production capacity;
- Technical problems;
- Delays in setting up distribution;
- Customer reluctance to change.

Although these results are derived from manufacturing industry and they are almost half of a century old, most of them are relevant for mobile operators today. If mobile operator is launching a service that requires new radio network the first problem is coverage. Operator needs to rapidly build coverage so that the new capacity service can be distributed to all customers. New services require new technologies and modifications to old technologies, which inevitably lead to shake down periods with numerous technical problems whenever new services are introduced. All of these problems have to be tackled so that the customers believe that the service is actually working and not in a trial stage. Capacity problems are usually not very serious in the introduction stage. Operator equipment purchases are usually done as long term investments and the capacity that is purchased is supposed be sufficient for several years into the future. This is especially true for the access network. The installation of more capacity than actually needed can often be justified, so that there is capacity that could last for several years. Capacity will become an issue when the growth stage starts though.

The EDGE, UMTS, and WLAN equipment is not visible from beginning of the game (figure 11). These will become visible when the teams are ready for the technology, i.e. when the research and development info indexes are set to, at least the level of 1.

Main	Offers for Consumers	Offers for Corporations	Offers for Content Providers	Marketing	Research and Development
Roaming, MVNO, & Handsets	Network Maintenance	<b>Purchasing</b>	Human Resources	Financing & Cash Flow Statement	Income Statement & Balance Sheet

Purchasing						
Core equipment						
	Current capacity	Unit price (€)	Price (k€)	Season 0 Capacity	Season 1 Capacity	Graphs
PS core (simultaneous users)	3 000	100,00	0,00	3 000		Purchases: Core equipment
CS core (simultaneous users)	600 000	100,00	0,00	200 000		Purchases: Cellular radio network
Middleware, application and service platform	500 000	10,00	0,00	200 000		Purchases: WLAN network
HLR (# of subscribers)	2 500 000	10,00	0,00	1 500 000		
Billing and charging system (# of subscribers)	600 000	10,00	0,00	200 000		
Cellular radio network						
		Unit price (€)	Price (k€)	Season 0 Capacity	Season 1 Capacity	
GSM capacity (simultaneous users)	600 000	500,00	0,00	200 000		
GPRS capacity (simultaneous users)	3 000	1 000,00	0,00	3 000		
WLAN network						
		Unit price (€)	Price (k€)	Season 0 Capacity	Season 1 Capacity	

**Figure 11: The Purchasing window in MOB.**

## 2.10 The Human Resources Window

Human resources management is conducted with following two parameters: increase/ decrease in personnel and investment on personnel development. The employees are divided in to three categories: marketing, customer service, and research and development personnel. The modeling of human resources management is made very simple in MOB. Figure 12 shows the user interface of the Human Resources window.

Main	Offers for Consumers	Offers for Corporations	Offers for Content Providers	Marketing	Research and Development					
Roaming, MVNO, & Handsets	Network Maintenance	Purchasing	<b>Human Resources</b>	Financing & Cash Flow Statement	Income Statement & Balance Sheet					
<b>Human Resources</b>										
	<b>Marketing</b>	<b>Customer service</b>	<b>R&amp;D</b>							
Number of employees:	125	500	125							
Average salary per employee (€/month):	2500,00	2000,00	2900,00							
Increase/decrease of number of personnel (+/-):										
Employee motivation level:	1,1	1,1	1,1							
Previous investment on personnel development (€/person/month):	100,00	100,00	240,00							
Next investment on personnel development (€/person/month):										
<b>Development of employee motivation indexes</b>										
<b>Season</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>
Marketing:	1,1									
Customer service:	1,1									
R&D:	1,1									
<b>Graphs: Investments on personnel development</b>										
Investment on marketing	Investment on customer service	Investment on R&D	Investment on maintenance							

**Figure 12:** The Human Resources window in MOB.

## 2.11 The Financing and Cash Flow Statement Window

Currently not implemented in MOB!

## 2.12 The Income Statement and Balance Sheet Window

Under the Income Statement & Balance Sheet button, there are 4 sub windows. These are: the Budgeted Income Statement, the Income Statement: Previous Years, the Budgeted Balance Sheet, and the Balance Sheets: Previous Years windows. In this chapter only the Budgeted Income Statement and the Budgeted Balance Sheet windows are presented.

### 2.12.1 Budgeted Income Statement

In the Budgeted Income Statement window, the budgeted income statement for the current and the previous season are shown (figure 13). The revenues are divided into nine parts: consumer postpaid voice revenues, consumer prepaid voice revenues, consumer data revenues, consumer SMS revenues, consumer MMS revenues, corporate voice revenues, corporate data revenues, revenues from content, and revenues from roaming customers (the last two not implemented in the current version of MOB!).

Main	Offers for Consumers	Offers for Corporations	Offers for Content Providers	Marketing	Research and Development
Roaming, MVNO, & Handsets	Network Maintenance	Purchasing	Human Resources	Financing & Cash Flow Statement	<a href="#">Income Statement &amp; Balance Sheet</a>
<a href="#">Budgeted Income Statement</a>	Income Statements: Previous Years	Budgeted Balance sheet	Balance sheets: Previous Years		
<b>Budgeted Income Statement</b>					
<b>Budgeted income statement (k€)</b>					
		<b>Season 1</b>	<b>Season 0</b>		
<b>Revenues</b>					
Consumer postpaid voice revenues		0	0		
Consumer prepaid voice revenues		0	0		
Consumer data revenues		0	0		
Consumer SMS revenues		0	0		
Consumer MMS revenues		0	0		
Corporate voice revenues		0	0		
Corporate data revenues		0	0		
Revenues from content		0	0		
Revenues from roaming customers		0	0		
<b>Total</b>		<b>0</b>	<b>0</b>		
<b>Costs</b>					
Marketing expenses		0	0		
Maintenance expenses		0	0		
Purchasing expenses		0	0		
Corporate customer acquisition expenses		0	0		
Corporate customer relations expenses		0	0		
Personnel expenses		0	0		
R&D expenses		0	0		
Other expenses		0	0		
<b>Total</b>		<b>0</b>	<b>0</b>		
<b>Earnings before interest, taxes, and depreciation (EBITDA)</b>					
		0	0		
Depreciation from fixed assets		0	0		
<b>Earnings before interest and taxes (EBIT)</b>					
		0	0		
Financial expenses		0	0		
Taxes (29%)		0	0		
<b>Profit</b>		<b>0</b>	<b>0</b>		

**Figure 13:** The Budgeted Income Statement window in MOB.

The cost side again is divided into eight categories: marketing expenses, maintenance expenses, purchasing expenses, corporate customer acquisition expenses, corporate customer relations expenses, personnel expenses, research and development expenses, and other expenses.

The financial expenses consist of the interest paid for the short and long term dept that the team has taken and the tax rate is 29%.

### 2.12.2 Budgeted Balance Sheet

The balance sheet is a very simplified version of a company's balance sheet. The assets are divided into fixed assets and into cash and cash equivalents. Then we have the liabilities and the equity. The equity is divided into share capital, previous year profits, and profits for this year. The liabilities are divided into short term and long term dept. In the MOB model, there are no dividends paid.

Main	Offers for Consumers	Offers for Corporations	Offers for Content Providers	Marketing	Research and Development
Roaming, MVNO, & Handsets	Network Maintenance	Purchasing	Human Resources	Financing & Cash Flow Statement	<b>Income Statement &amp; Balance Sheet</b>
Budgeted Income Statement	Income Statements: Previous Years	<b>Budgeted Balance sheet</b>	Balance sheets: Previous Years		
<b>Budgeted Balance Sheet</b>					
<b>Budgeted balance sheet (k€)</b>		<b>Season 1</b>	<b>Season 0</b>		
<b>Assets</b>					
Fixed assets					
Cash and cash equivalents					
<b>Total</b>					
<b>Liabilities &amp; equity</b>					
<b>Equity</b>					
Share capital					
Previous years profits					
Profits for this year					
<b>Total equity</b>					
<b>Liabilities</b>					
Short term dept					
Long term dept					
<b>Total liabilities</b>					
<b>Total</b>					

**Figure 14:** The Budgeted Balance Sheet window in MOB.

### 3. Scenario Description

In this chapter a short presentation of the scenario of the market in the MOB model is described. The team represents a management team of one of the mobile operators in a small European EU-member country.

Because of the way a business game is used in teaching, it is very important that all the teams stick to the schedules that will be given during the actual session. If the teams are not able to do so, a penalty will be given to the team in question. The penalty is in a form of lost money in MOB and is decided by the facilitator.

#### *3.1 General*

The country where the teams operate in is democratic and promotes the development of the information society in the country. The market development is based on actions made by the private companies which must follow the prevailing law of communications market and the competition. For instance cartels and price agreements are not allowed between companies. If this would happen, the companies involved would be punished by local authority.

The population of the country is at the beginning of game (season 0) at 5200000. The population is expected to grow for many years to come. The growth rate is estimated to be approximately 0,15 - 0,25 percent per year.

The economy in the country is steady and quite healthy and the inflation is currently on a reasonable level at 2 percent. According to market analysts, this situation will continue also in the long run. Also interest rates are at a low level, currently ranging between 3-5 percent. The interest rate level will not see any drastic movement in the forthcoming years, at least according to some analysts.

#### *3.2 The Mobile Communications Market*

Every mobile operator which operates in the country is classified as an actor with significant market power (SMP). Supervision of the mobile communications market is done by the country's Communications Regulatory Authority (CORA). The most important tasks of CORA are to promote competition and to prevent anti-competitive behavior of SMP's.

The penetration rate of mobile voice subscriptions is currently 80,8 percent of the population, i.e. it is close to saturation. But, the penetration rate is still expected to grow. The estimation for the subscription growth rate for next season is at 7 percent. According to consultants, voice will remain as a cash cow for many years to come. The outlook for the growth in the subscription rate for the incoming 6 years is as follows:

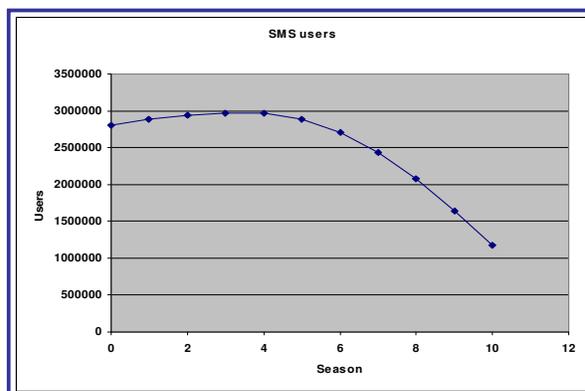
**Table 1:** The estimated growth rate in subscriptions and penetration rate.

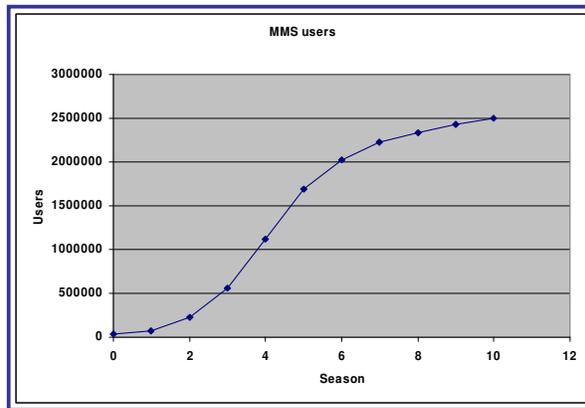
Season	1	2	3	4	5	6
Subs growth rate	6%	3%	1%	0,4%	0,3%	0,2%
Penetration rate	85,4%	90,4%	92,9%	93,7%	93,8%	93,9%

The amount of consumer subscriptions out of all the subscriptions is approximately 70 percent. The country's consumer customers have traditionally been quite focused on postpaid voice subscriptions, but according to some research this is going to change in the future. Currently 95 percent of the consumer voice subscriptions are postpaid. In five years this number is estimated to drop to about 87 percent.

Cellular data is currently in a situation where it is getting more and more popular. In the beginning GPRS is the only packet based data technology in use, but depending on the operators, EDGE and UMTS will emerge during the next few years. The number of cellular data users in the beginning of the game is low (approximately 30000). 65 percent of these are consumers and 35 percent corporate users. The cellular data growth rate will heavily depend on the operators' actions, but according to some estimates it could be as large as 300 percent during the first few seasons. The same assumptions can be made for the WLAN technology. A thing to remember is that the consumers' capability to exploit new services grows continuously.

SMS has traditionally been a very important service for the operators. Some studies have been made which indicate that SMS will slightly grow for a few years to come, but MMS will gradually replace SMS traffic. The estimated evolution of SMS and MMS users can be seen from figure 15 and 16. The MMS usage is at the beginning of the game growing by approximately 250 percent. During the fifth season the growth will decline to about 150 percent, i.e. the total amount of MMS users will then be, according to the estimates, approximately 1700000.

**Figure 15:** The estimated evolution of SMS.



**Figure 16:** The estimated evolution of MMS.

## 4. The First Season

In the beginning of the game all the teams have the same starting position. The history information is the same for all the teams. This includes the numbers in the income statement, the numbers in the balance sheet, previous year investments, amount of subscribers etc. This means that if someone were to make a SWOT analysis of the operators, the main differences between these analyses would be in the actual management teams and the strategy/ strategies that was/ were chosen by the management team.

## List of References

- 3GPP specifications, <http://www.3gpp.org/>.
- Buzzell, R. D. (1956). Competitive Behavioral and Product Life Cycles, in *New Ideas for Successful Marketing*.
- Faria, A. J. (1987). Survey of the Use of Business Games in Academia and Business, *Simulation and Gaming* Vol. 18:2.
- Faria, A. J. (1998). Business Simulation Games Current Usage Levels – An Update, *Simulation & Gaming* Vol. 29:3.
- Kokko, J. (2004). *Mobile Operator Business Game*, Helsinki University of Technology, Master's Thesis.
- Kotler, P. (1997). *Marketing Management*, 9<sup>th</sup> edition, Prentice Hall.
- Nokia home pages, <http://www.nokia.com/>.
- Töyli, J. (2001). *A Generic Business Management Simulation for Graduate Student and Managerial Training*, Turku School of Economics and Business Administration, Doctoral Thesis.

## Appendix 2

### MOB feedback form (April 2004)

Which alternative describes your opinion about the following statements. Fill in which statement that you think describes your opinion best. If you can't answer the question use the "I can't say/ no comments" alternative.	I totally agree	I agree	I agree/ I don't agree	I don't agree	I totally don't agree	I can't say/ no comments
<b>Goal</b>						
The goal for MOB was clearly presented	<input type="checkbox"/>					
The presented goals were achieved	<input type="checkbox"/>					
The grade (4-10) for the presentation of the goal						<input type="checkbox"/>

How could these be improved?

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Which alternative describes your opinion about the following statements. Fill in which statement that you think describes your opinion best. If you can't answer the question use the "I can't say/ no comments" alternative.	I totally agree	I agree	I agree/ I don't agree	I don't agree	I totally don't agree	I can't say/ no comments
<b>The player instructions</b>						
The player instructions gave enough information for decision making	<input type="checkbox"/>					
It was hard to find what was important from the player instructions	<input type="checkbox"/>					
The environment described in the player instructions reminds the real world	<input type="checkbox"/>					
The grade (4-10) for the player instructions						<input type="checkbox"/>

How should the player instructions be developed further (are there things that should be added/ things that should be removed)?

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Which alternative describes your opinion about the following statements. Fill in which statement that you think describes your opinion best. If you can't answer the question use the "I can't say/ no comments" alternative.	I totally agree	I agree	I agree/ I don't agree	I don't agree	I totally don't agree	I can't say/ no comments
<b>Success factors</b>						
A strategic approach was needed to succeed	<input type="checkbox"/>					
A systematic and well planned approach helped in succeeding	<input type="checkbox"/>					
Good knowledge about the mobile operator business helped in succeeding	<input type="checkbox"/>					
The success in the game was only about luck	<input type="checkbox"/>					

Which alternative describes your opinion about the following statements. Fill in which statement that you think describes your opinion best. If you can't answer the question use the "I can't say/ no comments" alternative.	I totally agree	I agree	I agree/ I don't agree	I don't agree	I totally don't agree	I can't say/ no comments
<b>Complexity/ realismity of MOB</b>						
The MOB game seemed realistic	<input type="checkbox"/>					
The actions of the competitors had been, reasonably enough, taken into account	<input type="checkbox"/>					
The MOB game was too complicated	<input type="checkbox"/>					
The world in MOB functioned according to what you have learned	<input type="checkbox"/>					
The MOB game was demanding	<input type="checkbox"/>					

Which alternative describes your opinion about the following statements. Fill in which statement that you think describes your opinion best. If you can't answer the question use the "I can't say/ no comments" alternative.	I totally agree	I agree	I agree/ I don't agree	I don't agree	I totally don't agree	I can't say/ no comments
<b>Generally about MOB</b>						
MOB was easy to use	<input type="checkbox"/>					
MOB gave enough information for making decisions	<input type="checkbox"/>					
During the MOB session, the players got enough feedback to be able to play the game	<input type="checkbox"/>					
<b>Guidance</b>						
The guidance during the game was important	<input type="checkbox"/>					
The facilitator succeeded well in his task	<input type="checkbox"/>					
<b>Arrangements</b>						
The team was too big (our teams size was: _____ persons)	<input type="checkbox"/>					
There was enough time for decision making	<input type="checkbox"/>					
The MOB game could have been played via email	<input type="checkbox"/>					

What additional information should be displayed in the MOB game?

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What currently displayed information shouldn't be displayed?

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<b>Learning and knowledge</b>	
<b>The grade (4-10) for the following issues</b>	
The grade for the teaching:	<input type="checkbox"/>
The grade for the MOB game:	<input type="checkbox"/>
The grade for your own learning:	<input type="checkbox"/>
The grade for your teams success in the game:	<input type="checkbox"/>
The grade for my own effort in the game:	<input type="checkbox"/>

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Comment what you learned during the MOB session. What do you think about this kind of teaching compared to normal lecturing?

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How should the teaching, in your opinion, be developed further?

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How should MOB be developed further?

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Comments to the facilitator, and his actions during the game:

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## Appendix 3

### Preliminary exercise for MOB sessions April 2004

#### HELSINKI UNIVERSITY OF TECHNOLOGY

#### MOB Preliminary Exercise

Networking Laboratory

18.04.2004

S-38.041 Networking Business, spring-04

Hämmäinen/ Tallberg

The answers to the preliminary exercise should be returned as one copy per team. The format should be as a PDF or as a Word document and it should be returned to the course assistant before Sunday April 18 at 24:00 (for all the sessions) via email (mathias.tallberg@TKK.fi). The length of the preliminary exercise report should be at least 2 pages and preferably not longer than 3 pages.

The main task in this preliminary exercise is to formulate an overall generic strategy over how to succeed in the game. According to Porter there are three fundamental ways in which a company can achieve sustainable competitive advantage. Porter's three generic strategies are as follows:

- A cost leadership strategy
- A differentiation strategy
- A focus strategy.

**TASK 1:** Define your own vision of the evolution of the mobile market, either taking into account the consultant opinions (in MOB player instructions) or not. Remember, your vision is the basis of you strategy!

**TASK 2:** Explain what is meant by a cost leadership strategy! How could your team use this kind of a strategy in MOB? Can you find any mobile operators using this kind of strategy in Finland? Why/ why not?

**TASK 3:** Explain what is meant by a differentiation strategy! How could your team use this kind of a strategy in MOB? Can you find any mobile operators using this kind of strategy in Finland? Why/ why not?

**TASK 4:** Explain what is meant by a focus strategy! How could your team use this kind of a strategy in MOB? Can you find any mobile operators using this kind of strategy in Finland? Why/ why not?

**TASK 5:** Which of these generic strategies will your team use during the game session? Give an explanation why? (Try to follow the chosen strategy in the game as well, as long as it makes sense!) In your opinion, is there some other kind of strategy that would be better suit you and your team? Why/ why not?

## Appendix 4

### Final report for MOB sessions April 2004

#### HELSINKI UNIVERSITY OF TECHNOLOGY

##### MOB Final Report

Networking Laboratory

07.05.2004

S-38.041 Networking Business, spring-04

Hämmäinen/ Tallberg

The answers to the final report should be done individually. The format should be as a PDF or as a Word document and it should be returned to the course assistant before Friday March 07 at 24:00 (for all the sessions) via email (mathias.tallberg@TKK.fi). The length of the final report should be at least 1 page and preferably not longer than 2 pages.

The main task in the final report is to analyze how your team succeeded in the game.

**TASK 1:** How did your team succeed in the game? What were the reasons for succeeding/ not succeeding in the game? E.g. was it because of something your team did or was it perhaps because of something that the competitors did?

**TASK 2:** How did your teams' actions differ from that of the plans that your team did in the preliminary exercise? Why? If they didn't vary differ from the plans, what were the reasons for this?

**TASK 3:** Which of the following features would, in your opinion, be good to have in MOB? Choose the statement that describes your opinion the best: (5) I totally agree, (4) I agree, (3) I agree/ I don't agree, (2) I don't agree, (1) I totally don't agree, or (0) I can't say/ No comments.

**Feature 1:** The Mobile Virtual Network Operator (MVNO) business

**Feature 2:** The roaming business

**Feature 3:** The mobile content business

**Feature 4:** The handset business

**Feature 5:** The spectrum auctions

Explain also briefly why you chose as you chose!

**TASK 4:** Which alternative describes your opinion about the following statements best: (5) I totally agree, (4) I agree, (3) I agree/ I don't agree, (2) I don't agree, (1) I totally don't agree, or (0) I can't say/ No comments?

**Statement 1:** The preliminary exercise added value to the learning of the game as a whole

**Statement 2:** Tasks 1 and 2 in the final report added value to the learning of the game as a whole