

Managing Positions in a Dynamic Environment

- New Technology Impact on Tactel and the Telecom Industry

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Abstract

- Title:** Managing Positions in a Dynamic Environment -
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- Problem discussion:** What is the forecast for the Telecom industry, with focus on its market drivers and main actors, the operators? How does IMS affect the operators' strategic position and how will other technologies, such as Skype, influence this? Given the outcome above, is it interesting and likely for operators to invest in IMS, and how will this affect smaller industry actors, such as Tactel's future position and strategic options?
- Purpose:** This Master Thesis aims to identify possible strategies for a smaller company in a dynamic environment, as new technology may shift the industry and market conditions. This will be exemplified by analysing the Telecom industry, resulting in suggestions regarding Tactel's position and strategic options.
- Methodology:** The Master Thesis is based on the open systems approach, due to the synergistic effects between the systems components and its environment. The process is based on inducting theory using an explorative case study. The data collected will be secondary quantitative, as well as primary and secondary qualitative.
- Conclusions:** The Telecom industry is facing a paradigm shift, where the industry is converging with Internet technologies and the market is becoming more sophisticated. This results in more demanding customers, and the need for offering more content and services with a focus on usability for the end-users. The operators are starting to lose both their strong position and revenue in the Telecom industry, due to new technology and the fact that other actors are starting to enter the market,

offering new content and services. In the end, the operators have two choices, to become bit-pipe providers, and only focusing on network management, or keeping the control over their networks. The latter would mean that they block other actors who are taking parts of their revenue, e.g. Skype who are their biggest threat when it comes to voice.

With IMS, being a centralised architecture, operators hope to keep their strong position in the network, and increase their overall revenue. Several operators and network vendors have already started to implement IMS. However, the “Big Network” that the industry is talking about, is questionable. First of all, this would require large investments from the operators, who already have weak financial statements from their current network infrastructure investments. Secondly, all operators have to join IMS to really get the most out of the network, and finally, it takes up to five years to fully implement. In addition to the IMS impact, Skype will keep experience a constant growth, since the network is becoming more and more IP based. Skype will particularly flourish when flat-rates are released by the operators, which is just a matter of time.

For smaller companies, such as Tactel, this paradigm shift makes their position and relationships even more important. In this case, Tactel should focus on building partnerships with equal actors, companies with the same technical interest or customers, and opt for bigger customers. Moreover, they should invest to some extent in in-house expertise regarding IMS, and find relationships with actors who have a broader knowledge of IMS to complement Tactel’s competence. This way, they do not have to tie up too much of their resources in the beginning, especially since they are not first movers and IMS’ role is still uncertain. Finally, they should try to find a niche in the range of their competences, which they can prosper from.

Keywords: Telecom industry, IMS, Skype, Industrial Network, Structural Hole, Technology Life-Cycle, Position, Relationship

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Fredric Arvinus Daniel Halvarsson

Table of Content

1	Introduction	13
1.1	Prologue	13
1.2	Problem Discussion.....	15
1.3	Purpose.....	15
1.4	Delimitations	16
1.5	Target Audience	16
1.6	Central Definitions	16
1.7	Disposition	17
2.	Methodology	19
2.1	Methodology Approach.....	19
2.2	Defining the Purpose and the Problem Discussion	20
2.3	Theoretical Study	20
2.4	Empirical Study	21
2.4.1	Conducting Interviews	21
2.5	Analysis of Theoretical and Empirical Studies	22
2.6	Validity and Reliability	23
2.7	Summary	23
3	Theory	24
3.1	Introduction	24
3.1.1	The Basic Concepts of Relationship Networks	24
3.1.2	Value Chains Create Value Systems	25
3.1.3	Deconstruction.....	26
3.2	Structural Holes	27
3.3	Industrial Networks	28
3.3.1	The Three Dimensions of Industrial Networks	29
3.3.2	Managing Relationships and Positions in Industrial Networks.....	30
3.3.3	Developing Relationships.....	31
3.3.4	The Different Stages of Relationships.....	32
3.3.5	Network Conditions and Connections.....	34
3.3.6	Industrial Network Markets.....	36
3.4	Technological Perspectives	37
3.4.1	Technology Life-Cycle.....	38
3.4.2	S-curve Model	40
3.5	Theoretical Framework	41
4	Technical Background.....	42
4.1	History of the Telecom Industry	42
4.2	Vertical Approach vs. Horizontal Approach	43
4.3	IP Multimedia Subsystem	44
4.3.1	The Benefits	44
4.3.2	IMS Elements	45
4.3.3	Layers	46
4.3.4	IMS Application Examples	46
4.4	Skype	46
4.4.1	The Benefits	48
4.4.2	Skype Elements	48

5 Empirical Study.....	50
5.1 Telecom Market Forecast.....	50
5.1.1 Operators	51
5.1.2 Other Actors	53
5.1.3 New Competitors.....	55
5.1.4 Conclusion.....	55
5.2 IMS.....	57
5.2.1 Operators	57
5.2.2 Other Industry Actors	60
5.2.3 Conclusion.....	61
5.3 Skype.....	62
5.4 Tactel.....	64
5.4.1 Resources and Competences	65
5.4.2 Relationships	66
6 Analysis.....	68
6.1 The Telecom Industry	68
6.1.1 Increased Competition.....	69
6.1.2 The Operators of Tomorrow.....	70
6.1.3 ...and the other Industry Actors	71
6.2 IMS's & Skype's Affect on the Operators	73
6.2.1 Operators' Different Options.....	74
6.2.2 The Risk with IMS for the Operators	75
6.2.3 Skype	76
6.3 Tactel.....	77
6.3.1 Will Operators Invest in IMS?	77
6.3.2 Tactel's Position and Future Options	78
6.4 Theoretical Analysis.....	80
7 Conclusions/Recommendations	83
7.1 The Telecom Industry of Tomorrow	83
7.2 The Impact of IMS & Skype	84
7.3 Three Recommendations for Tactel	86
7.4 Further Study.....	87
7.5 Reflections on the Research	88
8 References	89
Appendix I.....	96
Appendix II	99

Abbreviations

2G	<i>Second Generation</i> – is a mobile technology that enables digital communication.
3G	<i>Third Generation</i> – is a mobile technology with high data speed.
3GPP	<i>Third Generation Partnership Project</i> – is an organisation responsible for global standardisation for the third generation (3G) mobile systems.
ARPU	<i>Average Revenue Per User</i>
CS	<i>Circuit Switch</i> – when a call is made, a one line connection is established and maintained throughout the call. An individual call does not have its own physical wire, but follows a unique path throughout the call. This means that the data is received in the order it was sent and in an even flow. There is one major drawback with circuit switched technology, and that is its inefficiency when sending data. This is because the connection remains occupied throughout the call, whether data is sent or not.
GSM	<i>Global System for Mobile communication</i> – is an open standard which is currently developed by 3GPP. It is the world's most popular standard and allows international roaming that enables subscribers to use their phones in many parts of the world. Both signalling and speech channels are digital, which means that it is considered to be a second generation (2G) mobile system.
HSS	<i>Home Subscriber Server</i> – the centralised subscriber profile database in the IMS infrastructure.
IMS	<i>IP Multimedia Subsystem</i> – is architecture, with underlying technology, for services built on Internet Protocol core networks for mobile and fixed networks. The concept of IMS is allowing interaction between different networks and units, using reusable platforms and thus increasing the overall efficiency.
IP	<i>Internet Protocol</i> – a standardised protocol for data transmission.
KSF	<i>Key Success Factor</i> – is the factor that determines a companies ability to survive and prosper.
M&A	<i>Mergers and Acquisitions</i>
P2P	<i>Peer-to-Peer</i> – is an architecture that is based on the principle that network members, or peers, are connect directly to each other. P2P networks, in the purest form, have no centralised servers, and they are

inherently scalable and reliable because of the lack of a single point of failure.

PS	<i>Packet Switch</i> – allows voice to be digitalised and converted into packages, and then sent through the network independently of one another. It allows each packet to be directed, or routed, through the fastest and least loaded path to its destination. If a connection is lost on the way, the package will automatically find a new way to its destination, thus making it much more flexible than circuit switched networks. When the packages arrive to the receiving end, they are reassembled in the right order and converted to voice.
ROI	<i>Return On Investment</i> – the initial investment divided by annual revenues derived from the investment.
SIP	<i>Session Initiation Protocol</i> – is an application layer protocol that is used for establishing, modifying and terminating multimedia sessions in an IP network, and has emerged as the predominant protocol for handling multimedia sessions. It is a way of finding and routing control signals between endpoints.
Skype	A VoIP application that allows users to call other Skype users for free. SkypeIn and SkypeOut enable phone calls to fixed and mobile networks.
TCP	<i>Transmission Control Protocol</i> – is a protocol that verifies that all packages reach their final destination, resending them if needed.
TCP/IP	is a communication standard, used among other things by computers when talking to each other over the Internet. The name derives from two of the protocols in the standard, TCP and IP.
Telecom	<i>Telecommunications</i> – where <i>tele</i> is Greek for “far” and communication is the process of exchanging information, usually via a common protocol. A common description is that Telecom uses some form of electromagnetic energy covering many technologies such as radio, telegraphy, television, and telephone and data communication.
TLC	<i>Technology Life-Cycle</i>
UDP	<i>User Datagram Protocol</i> – is a protocol used to send data over IP.
UMTS	<i>Universal Mobile Telephone System</i> – is generally the preferred solution by countries that uses GSM, centred in Europe, and is currently managed by 3GPP.

- VoIP *Voice over IP* – is simply a term used for voice delivered using the IP-protocol mentioned previously.
- QoS *Quality of Service* – refers to the probability of a packet reaching the end-point in a network.

1 Introduction

1.1 Prologue

The Telecom industry is undergoing one of its most important changes in its over one-hundred-year history, and some are even talking about a new emerging communication paradigm¹. These new radical changes will have a profound effect on the infrastructure, end-users, and even the future direction of the new economy². There are several reasons for these changes, the first being deregulation of telephone services in the early 1980s³. This led to increased industry dynamics where customers are demanding higher quality services and richer experience, applicable to any of their devices^{4, 5, 6}.

Another important factor influencing the Telecom industry is the convergence with the Internet industry, with its emerging technologies and actors. Consequently, these factors are resulting in shifting industry positions and power between the industry actors.⁷ Established value chains are being broken up, as new powerful actors are entering the industry along with technological development, reinforcing market turbulence. To survive, every industry actor must understand their position in the value system.⁸

So far operators have enjoyed a strong position in the Telecom industry, controlling both the infrastructure and the content and services provided⁹. However, slower subscriber adoption and an increase in competition from emerging content and service providers is forcing operators to increasingly segment the market¹⁰. One of the operators' strategies has been to push out several services, but with limited success so far, except for voice providing and SMS. The reason for this is that operators are competing against new actors that are specialists in their respective fields (e.g. Yahoo, Apple, TV stations etc.), which have a clearly identified service.¹¹

The operators' Holy Grail so far, voice providing, is one of many services within multimedia, but will still be the single most important profit generator for mobile operators. A study shows a slow adoption of mobile multimedia services by the mass

¹ Poikselkä, M., et al. (2004) p 3

² Li, F., et al. (2002) p 452

³ Li, F., et al. (2002) p 453

⁴ Lewis, A., *Independent Consultant* (2006)

⁵ Huawei (2006) p 1

⁶ Lucent Technologies (2005) p 4

⁷ Li, F., et al. (2002) p 454

⁸ Li, F., et al. (2002) p 451

⁹ Li, F., et al. (2002) pp 466-467

¹⁰ Arthur D. Little & Exane BNP Paribas (2005) p 4

¹¹ Arthur D. Little & Exane BNP Paribas (2005) p 5

market: excluding voice, roughly 35 % of European mobile subscribers will be active mobile multimedia users in 2010. The voice revenues until 2010 are estimated to grow 0.9 % per year, reaching a total of EUR 76 billion, still constituting the majority of the total revenue.¹²

However, the prices per minute are decreasing, obliging mobile operators to seek new ways of retaining revenue¹³. As customers demand more complex services, operators are starting to look for new infrastructures that can give them greater freedom of setting up these new services and decreasing time to market¹⁴. An example of such an infrastructure, with new underlying technology, is IP Multimedia Subsystem (IMS), considered the “next big thing”, especially by operators and network vendors, but even by other industry actors¹⁵. Therefore, IMS can be regarded as the new technology with the potential to impact the Telecom industry and will be further analysed.

Being a centralised architecture, IMS can be seen as a billing system allowing operators to monitor both the signalling (number of connections to a certain service), as well as the data traffic for the end-users in their networks¹⁶. It is also a way to take advantage of the Internet industry’s flexibility and innovations, and still retaining the Telecom values such as security, control and interoperability¹⁷.

IMS will be able to continue giving operators control over the data communication in their networks, even though new applications based on Internet technologies, such as Skype offering free Voice over IP (VoIP), emerge and threaten their competitive advantage¹⁸. Eventually, all voice will be based on Internet protocol (IP) since this is more cost effective, but currently operators are afraid of turning mobile data into a commodity¹⁹. Especially, since the high price on mobile data is the only barrier of entry preventing Skype from entering the mobile voice provider segment²⁰. The introduction of flat rate would be a threat for the operators’ position, since it would allow companies such as Skype, to deliver free services like they do in the Internet industry.²¹

In conclusion, free VoIP applications like Skype are a threat to operators’ voice revenue and IMS seems to be a way for them to prevent this from happening. The industry as a whole has embraced IMS, especially the majority of operators and

¹² Arthur D. Little & Exane BNP Paribas (2005) p 4

¹³ Arthur D. Little & Exane BNP Paribas (2005) p 5

¹⁴ Nokia (2004) p 3

¹⁵ Apertio (2006) p 4

¹⁶ Kristiansson, P., *Vice President Customer Segment, Network Operators*, Tactel, 12-13-2005

¹⁷ Svedberg, S., *Director – IMS – Strategic Product Management*, Ericsson, 03-22-2006

¹⁸ Kristiansson, P., *Vice President Customer Segment, Network Operators*, Tactel, 12-13-2005

¹⁹ Arthur D. Little & Exane BNP Paribas (2005) p 5

²⁰ Johansson, D., *Product Manager*, Tactel, 01-20-2006

²¹ Arthur D. Little & Exane BNP Paribas (2005) p 4

network vendors. However, this does not necessarily mean that rollouts are imminent or that IMS will prevail as the dominant architecture.²²

When the Telecom industry has become more complex, through deregulation and the lowering of the technological barriers to entry, the diversity of actors, their strategies and business models become increasingly important²³. Operators' actions and strategies have large impact on smaller actors and their position in the industry. To study this impact, a case study will be conducted on Tactel, a medium sized application developer that has both operators' and handset vendors as customers. The company is based in Sweden, has a turnover of EUR 30 million 2005 and approximately 150 employees.

So far Tactel has been very successful, but Tactel's relationship with operators risk to be affected if operators, e.g. decide to only focus on network access and outsource all their services and content to a third party. At the same time, Tactel must evaluate new technologies, in this case IMS and Skype, and their market impact.

How should a smaller company, like Tactel, which has limited possibilities to influence the industry due to its size, act in this dynamic environment? To help answer this question, theories such as industrial networks, structural holes and technology life-cycles will be introduced and used in the analysis of the actors' position, which is highly dependent on operators' actions. Tactel's situation is probably shared by other actors in the industry, even in industries with similar characteristics.

1.2 Problem Discussion

What is the forecast for the Telecom industry, with focus on its market drivers and main actors, the operators? How does IMS affect the operators' strategic position and how will other technologies, such as Skype, influence this? Given the outcome above, is it interesting and likely for operators to invest in IMS, and how will this affect smaller industry actors, such as Tactel's future position and strategic options?

1.3 Purpose

This Master Thesis aims to identify possible strategies for a smaller company in a dynamic environment, as new technology may shift the industry and market conditions. This will be exemplified by analysing the Telecom industry, resulting in suggestions regarding Tactel's position and strategic options.

²² The Moriana Group (2006) p 25

²³ Li, F., et al. (2002) p 458

1.4 Delimitations

The Master Thesis will focus on the service providing, in particular voice providing, due to the fact that this is the service that makes up for most of the profit in the Telecom industry. Focus will also be on the strategic impact of different standards and not on technical proficiencies. The authors' aim is to study the impact of IMS and Skype on the industry actors' positions. Another focus will be on the relationships per se, and not on the activities and resources behind them as much. In order to understand and analyse this, it is essential to focus on the operators' role since they currently possess the strongest position in the Telecom industry. To better grasp and analyse the situation, the Scandinavian market has been chosen since it can be regarded as an indicator for the majority of the western markets.

1.5 Target Audience

The target audience for this Master Thesis is primarily the management of Tactel. It is intended to be an evaluation of the current market situation of the Telecom industry, resulting in a forecast regarding market drivers and their affect on the different actors. Suggestions will be made about Tactel's future businesses and customer relationships. Secondly, it is aimed to those with an interest in IMS, who seeks to better understand the architecture and its possibilities. Thirdly, the Master Thesis is aimed for medium sized companies in a dynamic environment, where new technologies may shift their industry and market conditions. The final target group is those who are academically interested in industrial networks, structural holes and technology life-cycles, and the way these theories can help companies to better understand their possibilities in a dynamic environment.

1.6 Central Definitions

Industry – is the arena where all the actors can be found.

Market – is where the actors make “profits”.

The Telecom Industry – is mainly referring in this Master Thesis to the mobile industry, with a focus on voice.

Industry Convergence – the driver behind the Telecom and Internet industry convergence is technology convergence.

Network Convergence – means the ability to reach and use a certain service between different devices and networks.

Interoperability – means the functionality behind network convergence.

1.7 Disposition

The Master Thesis is based on inducting theory using a case study, on Tactel, which is a smaller company in the Telecom industry. By merging the theory and the collected empirical data, an analysis is introduced to the reader, which is followed by a conclusion. To better give the reader an overview of the Master Thesis's disposition, Figure 1 illustrates it schematically. A more detailed methodological description can be found in the chapter 2.



Figure 1. *The Master Thesis' schematic disposition*²⁴

Below follows short introductions to each chapter, as well as an illustration of the chapter's position in the above mentioned schematic disposition.



Chapter 2: Methodology – This chapter discusses the methodological approach used in this Master Thesis. It will thereafter explain the working methods for the theoretical and empirical studies, as well as the merging of these studies

that will lead to the analysis.

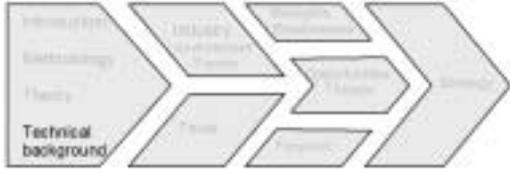


Chapter 3: Theory – The purpose of this chapter is to present the theories used in the Master Thesis. The chapter begins with an introduction, followed by a brief presentation of networks in general. To better understand Tactel's

position, an explanation of Structural Holes and Industrial Networks is conducted. Finally, a presentation of Technology Life-Cycles is made, in order to better comprehend how companies are affected by, and can approach, different technologies.

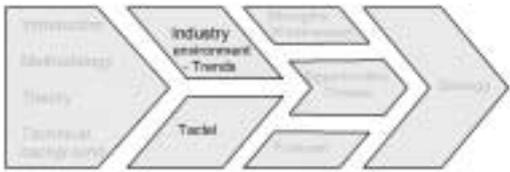
²⁴ Authors' own model

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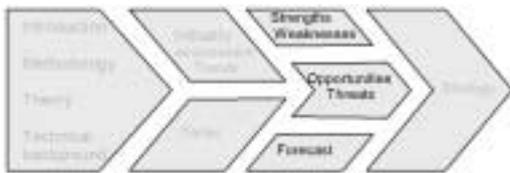
Chapter 4: Technical Background – The aim of this chapter is to first give a short history introduction of the Telecom industry, and secondly give the reader an explanation regarding IMS and Skype. This explanation is important for

analysing how these technologies might shift the industry and market conditions for a smaller company in a dynamic environment.



Chapter 5: Empirical Study – To be able to forecast and predict the potential opportunities and threats of the Telecom industry, this chapter aims to identify the current market trends and drivers, as well as Key Success Factors (KSFs).

These are presented in tables at the end of each section respectively. This is followed by an internal study of Tactel, which will be the basis for their strengths and weaknesses in the analysis chapter. The empirical study ends with a study of IMS and Skype.



Chapter 6: Analysis – The aim of the analysis is to find answers for the problem discussion in Chapter 1, resulting in the recommendations found in Conclusions. First, an analysis of the Telecom industry's actors and their

positions is conducted, with focus on operators, followed by the impact of IMS and Skype. Finally Tactel's future options are analysed along with the presented theories.



Chapter 7: Conclusion – This last chapter presents the conclusion derived from the analysis and follows the same structure as the previous chapters; the Telecom industry, IMS and Skype, and finally Tactel, which includes three

recommendations.

2. Methodology



This chapter discusses the methodological approach used in this Master Thesis. It will thereafter explain the working methods for the theoretical and empirical studies, as well as the merging of these studies that will lead to the analysis.

2.1 Methodology Approach

There are several different methodological approaches to a study. However, since this Master Thesis is in direct relations to one single company and the events ahead, a case study approach was selected. This is particularly appropriate when analysing single events, in a complex context with a large number of unpredictable variables in a system, in this case the emergence of IMS in the Telecom industry and its actors within. The aim of such a case study is to gather knowledge of all the participants, and to understand why different actions occur. This can only be done through the use of qualitative and quantitative methods, together with a strong theoretical background.²⁵

When looking upon the unpredictable variables, it can be said that their constellation will differ from the reality they constitute. Thus, the reality itself is built upon interacting parts, where the relationships between them results in synergetic effects.²⁶ Taking this into consideration when looking at the Telecom industry, one might even go one step further, stating that the system as whole has even the ability to alter its own structure. In other words, this approach is equal to the open system approach.

The methodological approach began by defining the purpose and problem discussion. Already in this stage, the need for some data collection was necessary. The next step was to identify relevant theories that would help to answer the problem discussion. Thus, explain the situation and actions necessary for a smaller company to stay competitive and prosper, in this case in the Telecom industry. Since these theories are based on empirical observations, they can be referred to as inductive theories. Thereafter, an empirical study was carried out on the Telecom industry, regarding its actors, the current market situation, and the ongoing development. This resulted in the identification of several market drivers and key success factors for both the market itself, the actors, and for a couple of influencing emerging technologies. Finally, the theories and the empirical findings were merged together, resulting in an analysis and conclusion for the Master Thesis.

²⁵ Kyburz-Graber, R. (2004) p 2

²⁶ Bjerke, B. (1981) p 7



Figure 2. *The 5 steps conducted in this methodology chapter*²⁷

2.2 Defining the Purpose and the Problem Discussion

The very first step involves defining the purpose as well as the problem discussion. This is quite an essential part since it builds a body of knowledge to the Master Thesis, which will then be the basis of the theoretical study.²⁸ In other words, the definition will determine the methodology, and not the other way around.

During the research where data was collected to build the required knowledge for the first step, data was gathered that would also be part of the empirical data later on in the Master Thesis. This means that the process was inductive; meaning the theory is based on empirical studies.²⁹

To increase the dynamic of this approach, there are two steps that can be followed. The first step is to let the definition determine the methodology, and then after more and new research is conducted, the next step will be to allow changes of the research area.³⁰ This iterative method has been used throughout the Master Thesis.

2.3 Theoretical Study

The theoretical study administers the need of a theoretical foundation for data interpretation³¹. The theories used in this Master Thesis can be seen as instruments for the analysis ahead, and are gathered from both scientific publications and books.

After step one, see Figure 2, it stood clear that the theories needed for this study should first describe the environment the actors are in, as well as elucidate the potentials the less influential actors have in this industry. After several discussions, both in-between the authors themselves but also with the tutors, this led to the industrial network and structural hole theories. Furthermore, the focus from Tactel's part was also to get a better understanding regarding IMS, and the potentials it would bring to the industry. This led, in the same manner as above, to the technology life-cycle theory.

²⁷ Authors' own model

²⁸ Stuart, I., et al. (2002) p 2

²⁹ Nilsson, C-H. (1994) p 5

³⁰ Nilsson, C-H. (1994) p 2

³¹ Kyburz-Graber, R. (2004) p 6

The aim with the theoretical study was to give the reader an understanding of the underlying context of the whole situation, as well as a broad perspective of the different theories. It was also necessary to present the theories in a dynamic way, so that the red line between these different theories becomes clearer for the reader. The purpose was to develop a basic knowledge of the whole concept, in order to better understand the focus in the empirical study, as well as the direction the analysis and the conclusion takes.

2.4 Empirical Study

For this Master Thesis, an explorative case study has been chosen, meaning it tries to make the reader understand the case parallel to its context. This requires varying both analysis and theoretical explanations.³² The data collection (step three) is an essential part of the case study procedure, since knowledge and access is gained to the studied events. During the whole collection and analysis process, the data had to be viewed upon in a phenomenological way, with the goal of presenting it objectively.³³

Furthermore, the data collection had to meet the quality criterion of using multiple data sources, which makes the interpretation based on multiple perspectives. This method is also known as triangulation.³⁴ For this Master Thesis, secondary quantitative data has been collected from articles, books, whitepapers, scientific publications, publications, business reports, the Internet, newspapers and other documents. In addition, primary and secondary qualitative data has been collected from interviews. Many times throughout the empirical study, one source of data led to other useful sources through their references.

To get a plausible scope of the Master Thesis, the empirical study was conducted on the Scandinavian market, since it is comparable to other markets, and may serve as a worldwide indicator, even though it has its own characteristics. The aim of the empirical study is to make the reader understand the dynamic environment, which the Telecom industry presents, as well as the market drivers, KSFs and the different actors in it. These market drivers and KSFs were selected from the collected data, and were then categorised by the authors and presented in tables. In addition to this, there is also a technical background of the underlying technologies that has great potential to influence and change the industry of today.

2.4.1 Conducting Interviews

In order to get the wanted information from the interviewees there is often limited time to build up the needed trust. This is why it is so essential to illustrate the problem at hand, giving the participant a better understanding of the situation to begin with.³⁵

³² Kyburz-Graber, R. (2004) pp 2-3

³³ Kyburz-Graber, R. (2004) p 2

³⁴ Kyburz-Graber, R. (2004) p 7

³⁵ Stuart, I., et al. (2002) p 9

Therefore, the first interviews took place at Tactel, building up the basic knowledge of the general situation.

Then, by using the collected data from different sources, along with the conducted interviews, a schematic picture was developed, illustrating IMS and the background of the context. This was later used in the interviews outside Tactel, which was more for confirming the facts collected through the other references, in order to strengthen the reliability of the empirical study. Furthermore, new data was collected during the “external” interviews.

One of the biggest dilemmas with setting up the interviews with the other companies was the fact that the people, who were interesting interviewees, all had high positions within each respectively company. This made it sometimes impossible to get a hold of them or even get the time for an interview. Furthermore, the nature of the subject, made parts of the requested information confidential.

The interviews have all been of a discussion and speculating nature, since the main event has not yet taken place and some of the questions were related to market forecast. Furthermore, throughout the entire interviews, the questions have been as objective as possible by trying not to indicate or push the participant towards one particular variable.

2.5 Analysis of Theoretical and Empirical Studies

Analysing and interpreting information can sometimes be comparable with trying to make logic out of chaos. Important questions to try and answer are if the findings point to the same variables, and if there are patterns to be found. During the analysis, it is therefore vital to use some kind of structure and pattern.³⁶

To better understand the findings and getting a structure for the whole analysis, it started out with the overview of the market, and then working deeper into the information regarding all the actors and finally about IMS and Tactel. This way, the overall market drivers and KSFs were established, before analysing each category of actors and their impact and exerted power on the market. This way, the major patterns could be identified, before moving on to analysing the impact of IMS. The last step was to see how a smaller company, such as Tactel, would fit into this and how they should act accordingly.

The analysis was conducted through a iterative method, comprised of discussion between the authors, then going back and looking at the empirical and theoretical studies, and yet more discussion, finally ending in the written analysis.

³⁶ Stuart, I., et al. (2002) pp 9-10

2.6 Validity and Reliability

The big question regarding the reliability of this Master Thesis is if a single case study really is enough to base ones generalised conclusions on. This is in fact a hot subject today.³⁷ However, if the basis of the generalisation is an extensive amount of collected data as well as a fair spread of the different sources used, the overall reliability should be acceptable, as long as the greater majority of the data points towards the same findings. Since, in this Master Thesis, a variety of references have been used, all pointing towards the same variables, it is certain that the reliability is acceptable.

Validity on the other hand, has to do with whether or not the measurements in the study are conducive enough to make the generalised conclusion³⁸. By conducting with the two supervisors from the University, alongside the supervisor from Tactel, the validity of this Master Thesis has been confirmed from respectively. Furthermore, the identified market drivers and KSFs in the Empirical study were selected on the basis of constantly recurring in the different sources, not only a couple of times.

2.7 Summary

To summarise the methodology approach chosen, the Master Thesis is based on the open systems approach, due to the synergistic effects between the systems components and its environment. The process is based on inducting theory using an explorative case study. The data collected will be secondary quantitative, as well as primary and secondary qualitative.

³⁷ Kyburz-Graber, R. (2004) p 10

³⁸ Stuart, I., et al. (2002) p 7

3 Theory



The purpose of this chapter is to present the theories used in the Master Thesis. The chapter begins with an introduction, followed by a brief presentation of networks in general. To better understand Tactel's position, an explanation of Structural Holes and Industrial Networks is conducted. Finally, a presentation of Technology Life-Cycles is made, in order to better comprehend how companies are affected by, and can approach, different technologies.

3.1 Introduction

Deregulation and introduction of Internet technologies have fundamentally changed the Telecom industry. The industry is no longer characterised by just a few actors and their relationships between each other. There are now a significant larger number of actors, all with more fluid relationships towards one another, resulting in an increase of the overall competition in the industry.³⁹

However, building sustainable competitive advantages is very difficult in high-tech industries, especially for smaller companies, since every advantage erodes alongside new technological breakthroughs⁴⁰. Furthermore, the network effect in a high-tech industry is making it even more unstable since it is subject to technology lock-ins (meaning that the more a product is used, the more likely it is to emerge as a standard).⁴¹

3.1.1 The Basic Concepts of Relationship Networks

A company's network of relationships is a source of both opportunities and constraints. In an economic environment that becomes more competitive, the network assumes enhanced strategic importance. The network approach allows consideration of the strategic benefits from optimising not just a single relationship but the company's entire network of relationships.⁴²

Though networks can be quite stable over time, networks typically tend to be more dynamic in the short term. How networks evolve over time depends on both exogenous and endogenous forces. Put very simply, exogenous forces include environmental changes and turbulence, while endogenous forces refer to the actions made by companies and their affect on the future ties within the network.⁴³

³⁹ Li, F., et al. (2002) p 455

⁴⁰ D'Aveni, R. A. (1995) pp 45-48

⁴¹ Arthur, W. B. (1996) pp 103

⁴² Gulati, R., et al. (2000) p 204

⁴³ Gulati, R., et al. (2000) p 210

In these networks it is important for the management to identify and understand the value systems, see next section, and key actors through which the network produces value for the end-users. It is possible for large, powerful actors in a network to shape the development by influencing other key actors. A company's position in one network can benefit from entering another and at the same time limit its chances of being member of alternative networks.⁴⁴

3.1.2 Value Chains Create Value Systems

A value system can be seen as a company's value chain embedded in a stream of activities⁴⁵, see Figure 3. A product or service requires a set of these value activities that are performed by a number of actors, and can then be regarded as a big value adding chain. Value systems offer an analytical tool for describing network markets and the individual company's role in the activity structure⁴⁶.

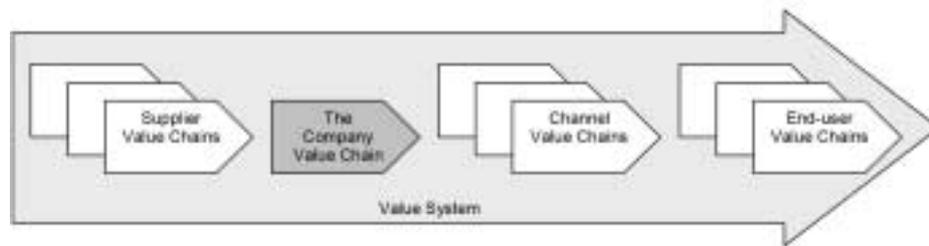


Figure 3. Value Chains and a Value System⁴⁷

The value chain theory was presented in 1985 and identified activities within a company, classified as primary and supportive activities. The latter, supports the sequential primary activities, adding value and cost for each activity or step, in the chain.⁴⁸

A company is a collection of economic activities, where strategy defines the configuration of activities and how they interact. Value refers to the value perceived by the end-user, from which the potential profit of a company ultimately derives. It is not sufficient to just create value, a company should also signal it through sales forces and other activities.⁴⁹

Inter-organisational relationship formations, for emerging value systems, are difficult to specify in advance, as they often pursue technology and business solutions that are significantly more effective than the existing ones. In the end, it is the relative

⁴⁴ Möller, K., et al. (2003) pp 217-218

⁴⁵ Porter, M. E. (1985) p 34

⁴⁶ Möller, K., et al. (2003) p 224

⁴⁷ Porter, M. E. (1985) p 35

⁴⁸ Porter, M. E. (1985) pp 36-39

⁴⁹ Porter, M. E. (1991) pp 102-105

importance of the value-creation activity in the value system that determines the position in a network.⁵⁰

Within these value systems, there exist a multitude of market entry points for competitors through different routes. Furthermore, they can be regarded as intertwined value chains where some nodes, or actors, are simultaneously involved in more than one value chain. Companies no longer only compete in an industry, but also with actors from other industries, resulting in highly complex and competitive industries. Transformation from value chains to these kinds of value systems has vast implications on involved actors, especially for their market positions, strategies and business models.⁵¹

Internal growth and inter-firm relationships increase the value provided by a network, either by providing access to a larger pool of users, or by increasing the areas of use by layering new services on top of existing networks. The value creation of networks lies not in transforming object *per se*, but in their mediation. The challenge is to build a pool of members which is sufficiently large in which the members complement each other. Thus, the value of a product increases with the number of product users. For example, the value of a phone is clearly dependent of the number of people you can call. Expectations about network size determine the value of membership and thus the actual size that the network attains.⁵²

3.1.3 Deconstruction

Deconstruction means that new actors fragment former value chains, or particular activities. To avoid deconstruction, a company in the Telecom industry should only focus on one of three activities; customer relationship, product innovation and commercialisation, and finally infrastructure management⁵³. For example, before the deregulation of the industry, operators were involved in the entire value chain, but the increased competition forces operators to focus on one of the above stated activities.

A company can choose between developing the activities internally or to acquire activities externally. It is a trade off between the values of specialisation against the higher transaction costs associated with external suppliers.⁵⁴ The Internet, making information increasingly free and accessible, has significantly reduced transaction costs. This means that specialisation will play a more significant role in determining the boundary between the company and the market.⁵⁵ The deconstruction process will result in radical restructuring of the telecommunications industry, where complex

⁵⁰ Möller, K., et al. (2003) pp 214-215

⁵¹ Li, F., et al. (2002) p 465

⁵² Fjeldstad, Ø. D., et al. (2004) pp 176-177

⁵³ Hagel, J., et al. (1999) pp 134-135

⁵⁴ Li, F., et al. (2002) pp 456-458

⁵⁵ *ibid.*

relationships will need to be formed between different actors in order to deliver services to the end-users.⁵⁶

3.2 Structural Holes

“...information and control advantages of being the broker in relations between people otherwise disconnected in social structure”⁵⁷

As mentioned previously, network characteristics can affect the profitability of the companies in an industry, and one important factor is structural holes⁵⁸. Put simply, structural holes are gaps between important contacts in for example a relationship network⁵⁹. Companies that occupy structural holes enjoy greater returns by being able to appropriate a larger share of the resources that flow through them.⁶⁰

The structural holes argument has its origin in the network theory that emerged in sociology during the 1970s. In a perfect market, there is one market price. In an imperfect market, there can be multiple prices as information asymmetry and disconnections between individuals leave some people unaware of the benefits they could offer one another. This leads to assets getting locked in suboptimal exchanges. An individual's or a company's position in the structure of these exchanges, can be an asset in its own right.⁶¹

Figure 4 provides an example of structural holes. Louise has a network that spans one structural hole as the two clusters, or non-interrelated groups, are not able to communicate without Louise. Hanna has a more diverse set of contacts. She has control over five clusters and spans ten structural holes, as she enables four connections for the first cluster, three

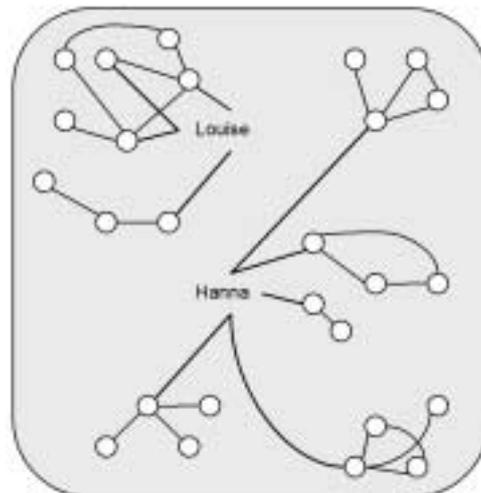


Figure 4. *Illustration of structural holes*⁶²

connections for the second cluster etc. Furthermore, Hanna benefits from enhanced information as she has more

⁵⁶ Li, F., et al. (2002) pp 456-458

⁵⁷ Burt, R. S. (1997) p 340

⁵⁸ Gulati, R., et al. (2000) p 205

⁵⁹ Burt, R. S. (1997) p 340

⁶⁰ Gulati, R., et al. (2000) p 205

⁶¹ Burt, R. S. (1997) p 340

⁶² Burt, R. S. (1997) p 341

diverse contact and higher volume. Since Hanna's contacts are linked through her at the centre of the network, she is the first to see new opportunities created in one group that could be served by the skills in other groups. This results in benefits as Hanna becomes more attractive as a contact in other networks.⁶³

The structural hole is an opportunity to control the information flow between people or companies, from opposite sides of the hole. A structural hole does not have to mean that two groups in a network are unaware of each other. They are simply so focused on their own activities that they have little time to attend the activities in the other cluster. Hence, complementary information flows on both sides of the structural hole. By overlapping the holes, the network benefits from a richer information flow.⁶⁴

A company that creates a bridge between otherwise disconnected contacts, also enjoys control benefits as it can influence whose interests to serve, as communication flows through the company. Competitive advantage is a matter of access structural holes and the competitive arena is believed to have a social structure where each actor has a network of contacts, e.g. connected nodes.⁶⁵ Companies occupying favored network position of bridging structural holes are likely to perform better because of their superior access to information⁶⁶. Networks, rich in structural holes, also present opportunities for entrepreneurial behavior⁶⁷.

3.3 Industrial Networks

An industrial network is a model of connected nodes, in this case industrial actors, who are interconnected through business relationships in an economic process to convert resources to goods and services for the end-user.

These business relationships are the company's source of effectiveness and efficiency, affecting all the actions taken by the company, and hence the outcome⁶⁸. The relationships introduce interdependency that creates the vital structure in the network⁶⁹. This is why interdependence and co-evolution are two very important characteristics in an industrial network⁷⁰. Segregation between different relationships does not exist, since any action taken in one relationship will automatically affect the other relationships⁷¹. How a company chooses to handle its relationships, is in itself a core task, and requires a certain strategy⁷².

⁶³ Burt, R. S. (1997) pp 341-342

⁶⁴ Burt, R. S. (1997) p 340

⁶⁵ Burt, R. S. (1997) pp 341-342

⁶⁶ Zaheer, A., et al. (2005) p 810

⁶⁷ Burt, R. S. (1997) pp 341-342

⁶⁸ Gadde L., et al. (2003) p 357

⁶⁹ Axelsson, B., et al (1992) p 16

⁷⁰ Gadde L., et al. (2003) pp 357-358

⁷¹ Ford D. (1998) p 43

⁷² Gadde, L., et al. (2003) pp 357-358

There are three paradoxes to be found when exploring an industrial network. The first paradox is that close relationships are the key for survival, and concerns the involvement with industry actors. The second paradox is that these relationships are also the key for influencing others. The third paradox regards the matter of decreasing innovation in a company when becoming more focused and successful in controlling ones ambitions. To handle these paradoxes, a company requires a strategy that can be implemented in three different dimensions of the industrial network: resources, activities and actors, see Figure 5.⁷⁴



Figure 5. *The three dimensions of the industrial networks*⁷³

3.3.1 The Three Dimensions of Industrial Networks

Resources

The value of a company's resources in an industrial network is the result of a combination with its counterparts, thus in direct contrast with the classical microeconomic view that the value of resources is perceived as given⁷⁵. Relationships both provide and consume resources. Hence, relationships and networks can be seen as both opportunities as well as constraints.⁷⁶

Activities

The primary activity in a network is interaction, which reflects the exchange of products and services between two companies⁷⁷. It is therefore vital to activate the counterparts in the development of strategies since isolation will not develop the relationships in the desired directions. Thus, the productivity of the company depends directly on the coordination of activities. A key success factor for a company is how its strategy relates to the counterparties ambition and activities, making the ability to develop and maintain relationships the core strategy for a company.⁷⁸

Actors

Even though a company's counterparts' ambition and activities are important, the individual actors may view the network in very different ways. This creates a form of uncertainty, where the bonds between the actors are not given in the dynamic environment. However, the network should not be mistaken to be arbitrarily developed; the logic behind it is only difficult to recognise. A careful analysis of the network will show interaction between the actors, all whom are trying to

⁷³ Authors' own model

⁷⁴ Gadde L., et al. (2003) p 358

⁷⁵ Gadde L., et al. (2003) p 359

⁷⁶ Gadde L., et al. (2003) p 360

⁷⁷ *ibid.*

⁷⁸ Gadde L., et al. (2003) pp 360-361

systematically influence one another. This indicates that influencing and controlling others are important drivers in the network.⁷⁹

To which extent a company can influence and control the counterparts, depends on its network position. The position itself depends on the relationships and the company's business partners, thus making every position unique. Although the company's ties, links and bonds restricts the freedom of action to a certain level, it also enables the altering of relationships during change processes, and hence its own position. This is an example of contradiction with the strategic management theory, which states that a single company's attempt to change position relies solely on its own resources.⁸⁰

The actors in the network can be categorised in two fields, active or passive. Active companies are those who want to change the structure through influencing its counterparts by altering activity patterns and resource constellations. The passive companies on the hand, adapts to the changes made in the activity and resource dimensions.⁸¹

In conclusion, a company's capability to act is determined by their ability to mobilise its resources and their ongoing activities, and requires continuous analysis of its relationships and connections⁸². Furthermore, companies should keep in mind that changing a network position to attain network success is a major strategic activity. This can only be achieved in the long run, and there will always be issues that the new position can not solve. Managing the relationships and positions is not an easy task.⁸³

3.3.2 Managing Relationships and Positions in Industrial Networks

To secure and maintain a network position, both time and commitment are essential ingredients. It is often necessary to conduct a cost-benefit analysis to see which relations to further invest in, since only a few of the isolated transactions will result, through a combination, in business relationships. During the process of developing these relationships, a chain of ad hoc arm's-length transactions are sometimes necessary to possess, resulting in a diverse relationship portfolio for many companies.⁸⁴

Even if a company puts in the time and commitment required, it is still no guarantee for success, since both position and relationships are not fixed in time. A network position can be seen as a location of power to influence business relationships. Even though a network position is not a dynamic concept, changes may still occur over a

⁷⁹ Gadde L., et al. (2003) p 361

⁸⁰ Gadde L., et al. (2003) p 362

⁸¹ *ibid.*

⁸² Gadde L., et al. (2003) pp 362-363

⁸³ Håkansson H., et al. (2002) p 138

⁸⁴ Low, K. H. B. (1997) p 190

given period of time. Hence, the company's position at time t_1 will not be the same as at time t_2 , resulting in relationship changes. This is due to the fact that the attractiveness of a company's resources and activities by the counterparts can not be guaranteed to be constant over time.⁸⁵

As previously stated, a close link between business relationships and positions can be observed. The link can directly be related to the structure of the network, which can either be loose or tight. In a tight structured network, the embedded relationships between the firms and the interdependency, act as high barriers of entry. However, in a loose structured network, interdependencies and relationships are relatively weak, making the barrier of entry fairly small. The later phenomenon can occur during a major environmental change, e.g. technical advancement, resulting in weakening positions for the existing network actors.⁸⁶

3.3.3 Developing Relationships

A company's relationships move into, and between, different stages throughout its life-cycle. Some relationships never reach the next stage of development, and this can be explained as the company usefulness disappears or that the interest from the other companies fades. Nonetheless, many relationships are long-lived and move through all the stages in a nonlinear fashion. To manage the development of relationships requires the company to handle the following five concepts; learning, investment, adaptation, trust and commitment and finally distance.⁸⁷

Learning is a vital process that deals with a company's uncertainties and abilities in a relationship. It helps to reduce the existing uncertainties between two parties, as well as teach them both to live with some of the uncertainties. The learning process is in direct co-relation with the development of relationships and can be divided into three dimensions, to which extent companies: need to learn, are willing to learn and have the ability to learn.⁸⁸

Investments in both tangible and intangible resources are necessary for obtaining effective and efficient relationships. Examples of different investments are: human resources, processes, products and services.⁸⁹

When an investment suddenly reaches beyond the normal procedures for a company, it becomes an *adaptation* and can be categorised as either formal (included in a contract) or informal (arises from e.g. a request). One way for companies to manage the expansive adaptations, is to include several relationships in one adaptation.⁹⁰

⁸⁵ Low, K. H. B. (1997) p 191

⁸⁶ Low, K. H. B. (1997) p 192

⁸⁷ Ford, D. (1998) p 26

⁸⁸ Ford, D. (1998) pp 26-27

⁸⁹ Ford, D. (1998) p 27

⁹⁰ Ford, D. (1998) pp 27-28

When getting involved in a new relationship, a company should be aware of the possibility that the counterpart might deviate from the long-term plans and try to take a shortcut when times becomes more strained. It is essential that both parties stay committed on the long-term, hence building a trust between them. It is this *trust and commitment* that both companies will gain from in the long run. However, the level of trust can vary, depending on each company's interest in the relationship.⁹¹

There are five types of *distances* in a relationship. The first one is the social distance, and regards to what extant two companies are familiar with each others working routines. Cultural distance is the second type, and refers to the norms and values of the two companies. The cultural difference depends on the origin of the company. The difference between the product and the production of the companies is known as the technological distance. The last distance is time, and refers to the time in-between negotiations and the actual delivery and payment of the product or service. Social interaction is one of the best ways to reduce this type of distance.⁹²

3.3.4 The Different Stages of Relationships

The Pre-Relationship Stage

Evaluating potential customers or suppliers requires a lot of time spent on evaluation procedures, resulting in a great deal of uncertainty. Companies often prefer to stay with an existing customer, rather than make large investments in new uncertain relationships.⁹³

When a company finally decides upon evaluating new counterparts, there are quite a lot of questions that have to be answered, all related to the previously mentioned concepts. One thing companies should be aware of is that it takes time to understand the counterpart's reasons to enter a new relationship, especially in this stage when the distance between the two companies is rather big. The best way is to move forward slowly, minimising the commitments before learning more about the other company.⁹⁴

The Exploratory Stage

Learning is the key concept in this stage. During the discussions and negotiations, both companies try to learn what the counterpart expects from them, what their interest is in the relationship, as well as what their working routines look like, in order to reduce the distance as much as possible between them.⁹⁵

Since this is still an early stage in a relationship, no routines or bigger investments have yet been made. Therefore, it is an uncertain and costly stage for both parties.

⁹¹ Ford, D. (1998) p 28

⁹² Ford, D. (1998) p 30

⁹³ Ford, D. (1998) pp 30-33

⁹⁴ Ford, D. (1998) pp 33-34

⁹⁵ Ford, D. (1998) pp 34-35

The lack of trust, due to no major commitments yet, is a big concern. For the companies to move on from this stage, commitment is necessary, earning the trust by demonstrating ones interest in the relationship.⁹⁶

The Development Stage

This stage is characterised by growth, mutual learning and reduced uncertainty. However, to build the trust even further, it requires action in the form of adaptation. Showing willingness to adapt is even more important for companies who are embarked in a relationship for the first time with each other.⁹⁷

There should be a distinction between the different adaptations a company encompasses. The formal adaptations are usually seen by the counterpart as mandatory, thus focusing purely on the formal will have somewhat of a negative affect on the relationship. It is the informal adaptations, seen as major commitment, which increases the trust in the relationship.⁹⁸

The Stable Stage

To reach this stage requires both companies having invested in the relationship, shown commitment and earned the counterpart's trust. By now, there are established routines in the way they conduct business. However, there are two sides of this stage. One is that the established routines can lead to standard procedures, reducing both the uncertainty and handling costs.⁹⁹

The other side is the negative affect of institutionalisation that can occur. In other words, both companies might focus on other issues than the procedures established by the relationship, which keeps handling costs down. This might result in the procedures growing further apart from both the companies' original requirements, without them noticing it.¹⁰⁰ Figure 6 shows the different development stages discussed above.

⁹⁶ Ford, D. (1998) pp 34-35

⁹⁷ Ford, D. (1998) pp 35-36

⁹⁸ Ford, D. (1998) p 36

⁹⁹ Ford, D. (1998) pp 37-38

¹⁰⁰ *ibid.*

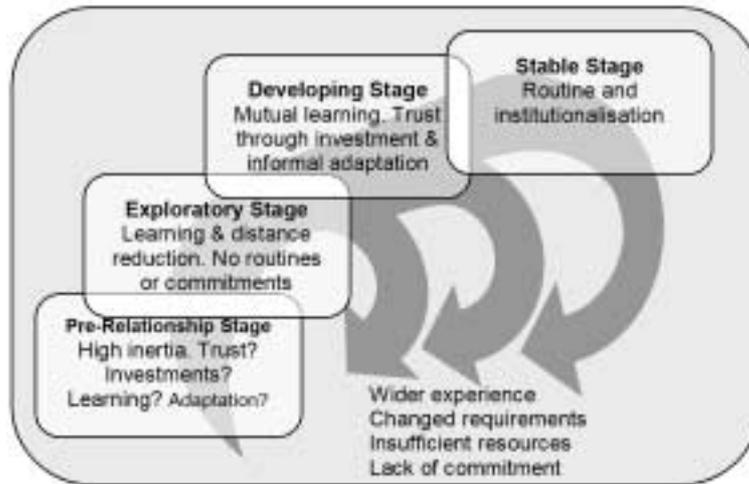


Figure 6. *The development of relationships*¹⁰¹

3.3.5 Network Conditions and Connections

Looking closer at the business relationships, there are still several questions that remain unanswered. How does connections emerge, what different types of connections exist and what is the process and outcome of each connection for the different actors?¹⁰² There are three different types of network conditions in which the connections can be found in: customer-supplier/supplier, supplier-customer/customer, and supplier-customer-end-user.¹⁰³

Customer-Supplier/Supplier

In this example there are one customer and two suppliers that are either competing for the customer or offers complementary products or services. This means that a negative or positive connection exists between the two suppliers. An example of positive connection is when suppliers are involved in a research and development situation and depends on each other for success. There are also examples when there is a mixed connection. This occurs when suppliers might be competing for business but depends on each others existence, when for example a customer demands independent suppliers in order to ensure material supply, or they abandon the relationship.¹⁰⁴

Supplier-Customer/Customer

This is the most common connection, and explains how business conduct with one customer might affect the relationship with other customers. Usually, new product or

¹⁰¹ Ford, D. (1998) p 29

¹⁰² Axelsson B., et al. (1992) p 44

¹⁰³ ibid.

¹⁰⁴ Axelsson B., et al. (1992) pp 44-45

technical development with one customer can at later stages be used in relationships with other customers, hence a positive connection. There are however a couple of instances, when this can not be done.¹⁰⁵

The first one is if the other customers have other performance requirements, and the second instance is if the customer places a restriction on the supplier's ability to use it elsewhere. The latter is yet another mixed connection, where the interaction with one customer might give the knowledge and skills, and at the same time sets the restriction to other customer opportunities.¹⁰⁶

Supplier-Customer-End-user

In this case the product or service goes through a chain of processing stages, from the supplier, via intermediate customers, until it finally reaches the end-user. This connection should be sought after when a product or service needs all the processing activities that this kind of chain can offer. If however, the supplier feels that the intermediate customers are of neutral affect for the product or service, they can choose to directly approach the end-user and weaken the position of the intermediary.¹⁰⁷

The previously mentioned action might be of mutual advantage for all three parties, resulting in a better fitted product or service for the end-user. Nevertheless, the supplier must be aware of the possible strain this action can put on the relationship with the intermediate customers in the chain. For example, suppliers can leap-frog the intermediary by offering a complementary product or service to the end-user. This is not to prefer if there still is interdependency between the different parties. Cutting off intermediate customers is still an approach to consider, when wanting to break down a negatively connected relationship between a customer and a competing supplier.¹⁰⁸

In conclusion, there will always be a positive connection to be found in these types of chains, since for example knowledge and skill exchanges between the supplier and customer, is in direct connection with the exchange between the customer and end-user. The parties should be aware of the complexity of connections in industrial networks; a positive connection in the short run can very well result in a negative connection in the long run.¹⁰⁹

Connections in a Buyer – Seller Relationship

To better explain the relationships in industrial networks one type of connection that can be studied are actor bonds. Actor bonds can be found between parties that interact

¹⁰⁵ Axelsson B., et al. (1992) pp 45-47

¹⁰⁶ *ibid.*

¹⁰⁷ Axelsson B., et al. (1992) pp 47-48

¹⁰⁸ Axelsson B., et al. (1992) pp 48

¹⁰⁹ Axelsson B., et al. (1992) pp 49-50

and influence each other¹¹⁰. Typical characteristics for these actors are that they invest in their relationships, which in turn increases their knowledge and trust in each other. By learning who a company's counterparts are, you will automatically get to know the company itself.¹¹¹

3.3.6 Industrial Network Markets

As mentioned earlier in this chapter, the ties in a relationship introduce interdependency and create structure in the networks¹¹². This is why interdependence and co-evolution are two very important characteristics in an industrial network¹¹³.

Business Market Characteristics

Compared to the traditional strategy development with market characteristics such as independence, equilibrium and homogeneity, the business market is completely dependent on relationships and does not focus to such an extent on "competitive strategy" and "one against all". The ways companies behave in a market is in direct connection with the existing relationships. Thus companies relate their strategies to three business market characteristics; heterogeneity, co-evolution and interdependency.¹¹⁴

The business market is *heterogenic* in the sense that all the companies differ to an extent in: history, size, culture, product and service offerings, knowledge, skills, capacity, performance etc. The various relationships in the market lead to higher differentiation between the companies.¹¹⁵

Co-evolution emphasises what has already been said, companies' relationship with each other is in direct relation to their development and actions taken. Developing strategies in this kind of market is about coping with the dynamics and changes around and inside a company, and not about sustainable strategies over a longer time.¹¹⁶

Interdependency as mentioned earlier in the chapter is about the three dimensions of resources, activities and actors, when developing strategies. The strategies will always affect the counterparts, and sometimes trade-offs are necessary for the benefit of the relationship.¹¹⁷

¹¹⁰ Gummesson, E., (2003) p 21

¹¹¹ Ford, D. (1998) p 42

¹¹² Axelsson B., et al. (1992) p 16

¹¹³ Gadde L., et al. (2003) pp 357-358

¹¹⁴ Ford, D. (1998) p 71

¹¹⁵ Ford, D. (1998) pp 71-74

¹¹⁶ Ford, D. (1998) pp 75-76

¹¹⁷ Ford, D. (1998) pp 76-79

Strategic Advice in Business Markets

If heterogeneity is the dominant characteristic in the business market, a company should develop differentiated strategies for each individual relationship. However, a certain standard between the relationships should benefit the company. This is in order to prevail being pulled away too far by the counterparts and also to keep cost down.¹¹⁸

A company in a business market that is seen as co-evolutionary has to focus on their own innovation and stay flexible in order to follow their counterparts' innovations, instead of trying to develop long-term sustainable strategies¹¹⁹. One way of not falling too far behind the forefront, is to keep in-house expertise in many of the pacing technologies that might become the key technologies of tomorrow. Another way is to maintain supervision over the pacing technologies, either by sponsoring research in Universities or joint ventures. University-funded research can be seen as an extension of a company's in-house fundamental research.¹²⁰

It is not always preferable or possible to generate all the in-house skills required, due to the complexity of many of the technologies. The key is to find the company's core competence and leverage the in-house skills with the externally acquired. Therefore, establishing a position within a technical area and then engaging in acquisitions or joint venture with specialists, for example, is a very good strategy.¹²¹

There are however some things that a company should keep in-house, in order to retain or obtain a competitive advantage. One thing is tacit knowledge, know-how, about a certain technology. This is not easy to transfer between companies since the knowledge is based on experience and therefore difficult to codify. Apart from tacit knowledge, technical capabilities are often preferred to possess in-house, especially when talking about speed to market. The stronger a company's capabilities are, the more they can control the technological development process.¹²²

3.4 Technological Perspectives

One of the most important tasks for a company is to commercialise new technologies in a fast and economically way and bring it to the market¹²³. It is important, not only to understand the company's products, but the underlying technology and whether to develop it in-house or acquire the technology from partners and suppliers. These decisions may have profound impact on the company's future ability to compete for many years.¹²⁴

¹¹⁸ Ford, D. (1998) p 79

¹¹⁹ Ford, D. (1998) p 80

¹²⁰ Tidd, J., et al. (2001) pp 221-223

¹²¹ Tidd, J., et al. (2001) p 225

¹²² Tidd, J., et al. (2001) pp 225-227

¹²³ Ford, D., et al. (2001) p 57

¹²⁴ Ford, D., et al. (2001) pp 51-53

There are two alternatives in acquiring technology, internal or external. The former means developing the technology in-house and the latter licensing or buying it externally. A company can also choose not to acquire the technology and simply by offerings from suppliers.¹²⁵

There are two different types of technology. *Product technology* refers to a company's problem solving ability, while *process technology* is the basis of its transfer ability. A company needs to combine both types of technology to satisfy customer requirements. Hence, affects both the company's position in the network and the relationship with customers and suppliers.¹²⁶

Furthermore, the two types of technology can be categorised depending on their competitive importance. *Basic technologies* are those that a company could not operate without in a network. *Distinctive technologies* are those that provide a competitive advantage.¹²⁷

3.4.1 Technology Life-Cycle

The technological development has been very fast and radical in the Telecom industry, dominated by the mobile telephone segment. New technologies have emerged as a series of distinct technology life-cycles (TLCs).¹²⁸ Emerging technologies create a dynamic environment where organisational flexibility is of great value as there are several development options and uncertainties about the value of the new technology.¹²⁹

A technology generation can be thought of as following a life-cycle, the TLC, and to understand it is important to first comprehend the fundamentals of Product Life-Cycles (PLCs). In general, the PLC is concerned with individual products or services, explaining their different phases from introduction, growth, maturity and to decline. The Technology Life-Cycle (TLC) can be regarded as the PLC concept applied on technological evolution with a macro perspective, where TLC represents a platform for successive generations of technology, see Figure 7.¹³⁰

¹²⁵ Ford, D., et al. (2001) p 55

¹²⁶ Ford, D., et al. (2001) pp 58-59

¹²⁷ Ford, D., et al. (2001) p 60

¹²⁸ Dalum, B., et al. (2005) p 229

¹²⁹ Wheatley, K. K., et al. (1999) p 35

¹³⁰ Kim, B. (2003) pp 371-372

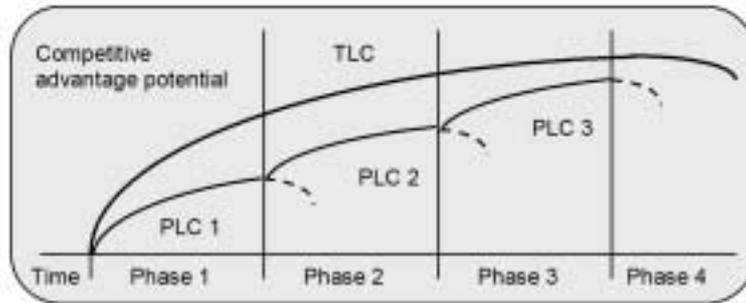
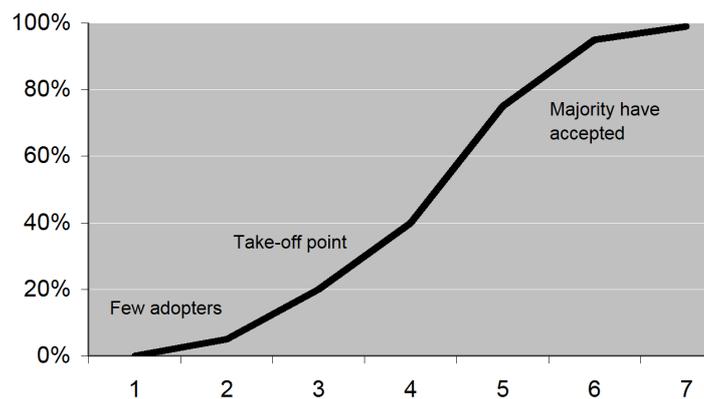


Figure 7. *The relation between TLC and PLC*^{131, 132}

Figure 7 can be used for understanding the emergence of key technologies. Initially there are many emerging technologies in phase one with different potential for competitive advantage, where only a few develop into pacing technologies, entering phase two. Only a few of the remaining develop into key technologies, entering phase 3, followed by phase four where they become established technologies.¹³³



Graph 1. *The Diffusion curve*¹³⁴

The diffusion curve, Graph 1, is very interesting for a company when evaluating their technology strategy and is to be regarded as a TLC. Initially, there are a few early adopters, and if not adopting the emergent technology the company should at least be aware of it. The take-off point is characterised by more actors adopting the new technology, and it is here where the greatest learning takes place. When the majority adopts the technology there is no longer any room for learning and the technology eventually becomes obsolete, thus flattening the curve.¹³⁵

¹³¹ Ford, D., et al. (2001) p 63

¹³² Luftman, J. N. (2004) p 3

¹³³ *ibid.*

¹³⁴ Luftman, J. N. (2004) p 11

¹³⁵ Luftman, J. N. (2004) pp 11-13

3.4.2 S-curve Model

The S-curve model is a way of illustrating the evolution of a technology over time, see Figure 8 Graph I, and can be regarded as diffusion curves over time. Performance can be measured in both technological performance and market penetration. Established technology is the current dominant technology in an industry, for example 2G networks in the Telecom industry.¹³⁶

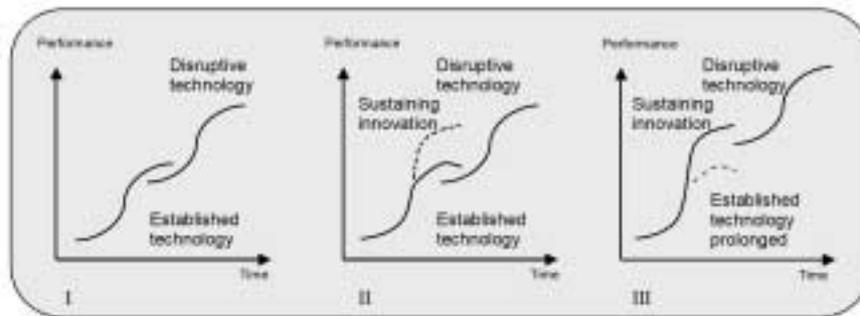


Figure 8. *S-curves for established technology affected by sustaining innovation*¹³⁷

The chosen definition of a disruptive technology is that changes in the basic technology may impact the industrial landscape¹³⁸. Disruptive technology, like 3G networks, may initially under perform the established technology to later outperform it, serving new customers and applications.¹³⁹

However, potential disruptive technologies, as seen in Figure 8 graph I, may not always win due to sustaining innovations (see dotted line in Figure 8 Graph II). The life-cycle of an established technology can be prolonged by sustaining innovations, like EDGE, which gives 2G networks data capacity similar to early 3G networks. Figure 8 Graph III shows how a sustaining innovation may delay the disruptive technology and set higher performance expectations, compare to Figure 8 Graph I. Disruptive technologies often come from smaller actors and not from industry leaders, which often leads to a shift of market leaders.¹⁴⁰

An industry's transformation and change often follow life-cycles, which are called industry life-cycles¹⁴¹. This life-cycle also has a close relationship to PLC, where the stages in the latter are replaced by entry, growth and exit. This is important as TLCs are more than a PLC but less than the industry life-cycle.¹⁴²

¹³⁶ Dalum, B., et al. (2005) p 232

¹³⁷ *ibid.*

¹³⁸ Dalum, B., et al. (2005) p 229

¹³⁹ Dalum, B., et al. (2005) p 232

¹⁴⁰ *ibid.*

¹⁴¹ Dalum, B., et al. (2005) p 231

¹⁴² Dalum, B., et al. (2005) pp 231-232

3.5 Theoretical Framework

To pinpoint the most important features of the three main theories above, and to have a graspable instrument for the analysis ahead, short summaries of the theories are presented below.

Industrial networks are useful for understanding business relationships between actors. This theory emphasises the importance for a company to evaluate its actions within the network as it will affect the rest of the company's relationships. Relationships offer both opportunities and constraints, and a position change can only be achieved in the long run. It is important with continuous analysis of the relationships as they tend to be dynamic in a short term, and to have a long term strategy for the relationships required in a specific network position.

Structural holes are a way of explaining why some company's enjoy higher profits than others. It is simply a question of information overtake enabled by a beneficial position within the network. When a company finds a position that links two otherwise disconnected clusters, it becomes an information broker. Superior access of information leads to control benefits and possibilities to influence whose interests to serve.

Technology follows life-cycles, TLCs, and can be acquired internally or externally. A technology adoption strategy is needed since there are several stages in technology adoption. Some companies are early adopters with a profile of always offering the latest technology. The take-off point is where the greatest learning is achieved, and the last stage is where the majority adopts the technology, with limited learning possibilities. Technologies, whose life time can be regarded as an S-curve, are replaced by disruptive technologies, shifting from one S-curve to another. Sometimes it is difficult to identify disruptive technologies like 3G networks, or IMS, as they initially under-perform the established technology but later outperform it.

In conclusion, the theories can be seen as both complementary to each other, as well as widening the general perspective of networks. First of all, the combination of industrial networks together with structural holes, gives a deeper view of how the bond between actors in a network really can look like. It gives different perspectives of the matter. Secondly, by combining this with technology life-cycles, a broader view of the actors in a network and its influencing factors, such as new technology, is presented.

4 Technical Background



The aim of this chapter is to first give a short history introduction of the Telecom industry, and secondly give the reader an explanation regarding IMS and Skype. This explanation is important for analysing how these technologies might shift the industry and market conditions for a smaller company in a dynamic environment.

4.1 History of the Telecom Industry

On June the 2nd, 1875, Alexander Graham Bell is believed to transmit voice for the first time, and files his telephone patent the following year. Today, there are four main categories by which an end-user, by using a handset, can connect to a telephone network, fixed, wire-less, satellite and VoIP. The communication across the network between end-users is today carried out by fibre-optic cable or point-to-point microwaves.¹⁴³

Until recently, telephone generally referred only to fixed phones, but mobile phones are expected to gradually replace fixed phones. Modern mobile phones use radio to communicate between handsets and nearby cell sites, or radio towers. A computer system switches the communication to the nearest cell on different channels without interrupting the call.¹⁴⁴

Telephone operating companies usually held a national monopoly but deregulation and liberalisation, starting in the early 1980s, meant that the market gradually opened up to competition. This meant improved and innovative services, price reductions, and network expansion and modernisation, where foreign investment played an important role.¹⁴⁵

Telephone networks are considered to be undergoing the most significant and comprehensive design change in their 100-year history with implementation of IP-based services. This change is, not surprisingly, affecting the entire Telecom industry, not only on the Scandinavian market, but worldwide.¹⁴⁶

The change is due to the emergence of the Internet, which merges computer network infrastructure with telecommunications¹⁴⁷. The modern Internet is a system of interconnected computer networks that are publicly accessible worldwide,

¹⁴³ en.wikipedia.org #3 (03-23-2006)

¹⁴⁴ ibid.

¹⁴⁵ Li, F., et al. (2002) p 453

¹⁴⁶ Kent, R., *Director of European Operations*, Adax (2006)

¹⁴⁷ en.wikipedia.org #1 (03-23-2006)

transmitting data by packet switching on the standardised IP. Internet carries various information and services, such as VoIP, on the World Wide Web.¹⁴⁸

Another big change is the transition from vertical networks to horizontal networks. This means that the need for setting up several networks, each dedicated to a specific media type, and e.g. voice, video and data, will no longer exist, leading to increased efficiency.¹⁴⁹

4.2 Vertical Approach vs. Horizontal Approach

Today's communication industry reflects a fast changing business climate, as well as convergence between Telecom and Internet technologies, increasing the need for flexible services¹⁵⁰. By adopting a horizontal network infrastructure, it will make it easier for communications service providers to develop and deploy services as well as data and resource sharing within the network, thus increasing the overall flexibility¹⁵¹.

The vertical approach is based on the concept of deploying single platforms for every new type of service offered, as shown in Figure 9 to the left. Since it was considered both cost effective and simple, it has been the method of choice for a long time. However, as customers demand more complex services, the efficiency is decreasing due to the fragmentation of the network and the need to duplicate functionalities.¹⁵²

The horizontal approach on the other hand, see Figure 9 to the right, offers a modular layer approach,

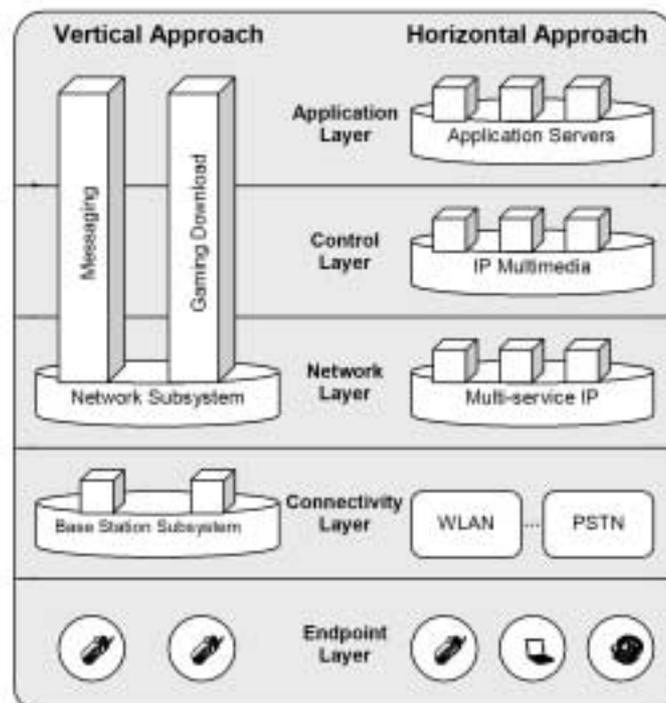


Figure 9. Illustration of the vertical and the horizontal infrastructure¹⁵³

¹⁴⁸ en.wikipedia.org #2 (03-23-2006)

¹⁴⁹ Sinnreich, H. et al. (2001) p 2

¹⁵⁰ Bea Systems (2005) p 6

¹⁵¹ NEC (2004) p 6

¹⁵² ibid.

¹⁵³ Authors' own model

where each layer has its own service elements¹⁵⁴. Operators are given a greater freedom of setting up new services, enabling the same functions to be reused for multiple applications as well as decreasing time to market¹⁵⁵. An example of a horizontal infrastructure is IMS.

4.3 IP Multimedia Subsystem

“IMS is a strategic anchor point for next generation services and integrated service platforms. Standardization, integration and modularity are the key to success”¹⁵⁶

IMS lays the ground for the next generations increasing service demands, converging fixed telecommunication networks with IP infrastructure, offering new types of multimedia sessions for its users¹⁵⁸. IMS is a concept developed by 3GPP, and has gone through two releases, Release 5 & 6. The architecture is based on SIP, which enables real-time invitations, multimedia and multiparty sessions.¹⁵⁹ The concept of IMS is allowing UMTS network to provide all of its services over IP, allowing interaction between different services in any combination, using reusable platforms, see Figure 10¹⁶⁰.

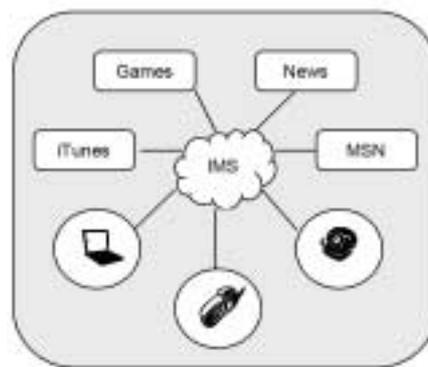


Figure 10. An overview of IMS and its environment¹⁵⁷

4.3.1 The Benefits

One of the major benefits with IMS is that the appropriate Quality of Service (QoS) can be allocated for each session. The operator can ensure that the bandwidth used during a session is in line with the bandwidth paid for by the subscriber. In other words, no user can ask for high QoS and then use it for a simple data session.¹⁶¹

The control of the media stream by the operators enables an accurate and efficient billing procedure. This procedure has evolved from the GPRS Product Switched Core

¹⁵⁴ NEC (2004) p 7

¹⁵⁵ Nokia (2004) p 3

¹⁵⁶ Intel (2005) p 3

¹⁵⁷ Authors' own model

¹⁵⁸ Bea Systems (2005) p 5

¹⁵⁹ ibid.

¹⁶⁰ IntelliNet Technologies (2005) p 13

¹⁶¹ SIPKnowledge (2004)

Network charging, and includes three different types of charging levels – the use of: the data pipe (e.g. GPRS), multimedia service (IMS), and different applications.¹⁶²

Furthermore, the user will only receive a single bill in the end, even though roaming has occurred on to a visited network, thus getting charged from both the home and visited network. Operators using IMS will also have the opportunity to choose on what the charging will be based on: media type, or time and/or volume of traffic.¹⁶³

4.3.2 IMS Elements

To better illustrate the general concept of IMS and all of its elements, Figure 11 will only display the IMS core network, which consists of the Call Session Control Function (CSCF) and the Home Subscriber Server (HSS). For those readers who are looking for a complete list of all the elements and a detailed description of a call session, see Appendix I.

The CSCF is a SIP proxy and registrar server, whose main tasks are to handle the registration and rout the correct applications and IMS networks to the endpoints¹⁶⁵. The HSS is a central database that enables operators to better handle subscriber data. It stores data such as user identity, registration information (IP address), buddy list/instant messaging information, voicemail options etc¹⁶⁶.

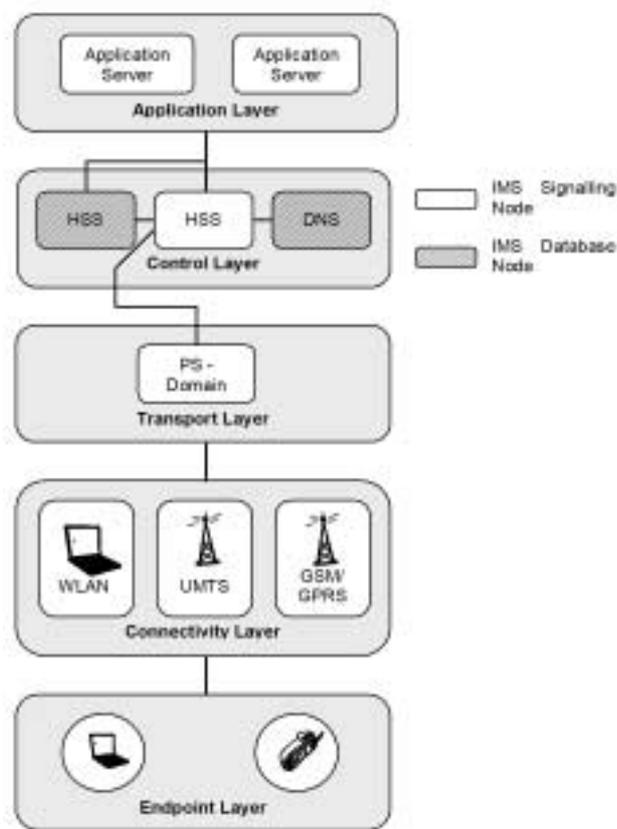


Figure 11. *The IMS infrastructure with all its layers and elements*¹⁶⁴

¹⁶² SIPKnowledge (2004)

¹⁶³ *ibid.*

¹⁶⁴ Authors' own model

¹⁶⁵ Bea Systems (2005) p 9

¹⁶⁶ *ibid.*

4.3.3 Layers

The Application Layer provides applications and services to the different sessions. *The Control Layer* allows the user's different devices to be registered with the IMS network. It also sets up the sessions between the users and allocates the requested services. *The Connectivity & Transport Layer* sets up and controls the sessions. *The Endpoint Layer* constitutes the different devices that can be used for a session¹⁶⁷.

4.3.4 IMS Application Examples

Push to talk is an imitation of the traditional walkie-talkie service, where one person speaks, and the other only can listen. In other words, it provides a one-to-one or one-to-many voice communication with the push of a key¹⁶⁸. *Presence* enables status information about other subscribers, such as their connection status, terminal capability and availability, etc.¹⁶⁹.

File sharing is possible between mobiles and IP connected devices. *Video sharing* enables real time one-way video, during a voice session. *Messaging* is an advanced SMS service, where the subscriber can use different messaging technologies enabling text messaging, chat, voice and video messaging as well as multimedia and application messaging. *Voice over IP (VoIP)* enables the user to contact both fixed and mobile SIP clients, as well as PSTN clients. *Rich call* enables an integration of voice, text and video to a seamless experience for the user¹⁷⁰.

4.4 Skype

Skype, the Internet phone company founded in 2003 by Niklas Zennström and Janus Friis, is according to them, "*the world's first decentralized telephony network*"^{171, 172}. Since 2003, until October 2005, more than 2 billion minutes were logged and it became the fastest growing application in the Internet's history¹⁷³. It is based on the same principles as KaZaa, and is a free VoIP client that provides its users with a variety of communications and related services including: VoIP, presence, file sharing and messaging¹⁷⁴.

¹⁶⁷ IntelliNet Technologies (2005) p 20

¹⁶⁸ Nokia (2004) p 6

¹⁶⁹ *ibid.*

¹⁷⁰ *ibid.*

¹⁷¹ Skype (2005) p 1

¹⁷² www.skype.com (02-01-2006)

¹⁷³ businessweek.com (04-11-2006)

¹⁷⁴ Baset, S. A., et al. (2004) p 1

The application is based on P2P principles, making Skype the first VoIP client based on P2P technology^{175,176}. P2P is decentralised network architecture, meaning that e.g. a computer network using these principles relies only on the computing power and bandwidth of the participants in the network, called nodes. A node is a processing location, usually a computer, which has a unique network address, allowing peers to communicate directly with each other.¹⁷⁷

Skype can be seen as a virtual network of nodes and logical links that are built on top of an existing network, with the purpose to implement a network service that is not yet available in the existing network¹⁷⁸. To do this, Skype's protocol uses TCP for signalling, and both UDP and TCP for transporting the media traffic¹⁷⁹. However, media traffic and signalling are not using the same transport protocols. The call signalling is always carried over TCP, and if both Skype clients are on public IP address, then the encrypted media traffic flows directly between them over the UDP.¹⁸⁰

Skype's protocol is not yet fully understood by the industry since it is proprietary, meaning it is not based on open protocols such as SIP (which is used by e.g. IMS) but company owned¹⁸¹. UDP is preferred by the Skype protocol for voice transmission. Even when none of the two parties in a voice conversation is talking, data packages are still floating between them¹⁸². Depending on network conditions and bandwidth, Skype is using between 3-16 kilobytes per second¹⁸³.

Unlike MSN Messenger for instance, which signs out the user if that user logs in on other machine, Skype allows a user to be logged on several devices simultaneously. An incoming call is routed to all locations, e.g. when the user answers the call it is immediately cancelled on the other devices.¹⁸⁴ If Skype is used on a flat rate connection to the Internet, it is free to call other Skype users. By using SkypeOut and SkypeIn it is possible to make and receive calls from regular phone and mobile phone users.¹⁸⁵

¹⁷⁵ Baset, S. A., et al. (2004) p 9

¹⁷⁶ Singh, K., et al. (2004) p 3

¹⁷⁷ *ibid.*

¹⁷⁸ www.cs.virginia.edu (02-01-2006)

¹⁷⁹ Baset, S. A., et al. (2004) p 2

¹⁸⁰ Baset, S. A., et al. (2004) p 10

¹⁸¹ Singh, K., et al. (2004) p 3

¹⁸² Baset, S. A., et al. (2004) p 10

¹⁸³ www.skype.com (02-02-2006)

¹⁸⁴ Baset, S. A., et al. (2004) p 10

¹⁸⁵ tools.netgear.com (02-04-2006)

4.4.1 The Benefits

A major benefit with Skype is that the end-user does not have to configure any gateways or firewalls, in order to use Skype, since it works behind the majority of them¹⁸⁶. Other positive attribute with Skype is that it allows users to set up a buddy lists, block individuals and enable privacy options that only allow trusted contacts to contact the Skype client. The most important benefit is that it is a free application, and cheap to use.¹⁸⁷

4.4.2 Skype Elements

To better illustrate the general concept of Skype, Figure 12 shows Skype and its three main elements: the ordinary nodes, the super nodes and the login server. The super node is a high performing node. It maintains the presence information for nodes, and locates other users by communicating with other super nodes. Super nodes are regular Skype client, providing assistance to the Skype network by handling contact lists and call-routing.¹⁸⁸

Skype clients interact directly with each other to ensure that the network directory is up to date. The Skype network is able to do this by its proprietary Global Index distributed

directory. When a Skype client becomes a super node, it accepts network connections from a small number of other Skype users, which maintains the Global Index accurate.¹⁹⁰

A peer may suddenly disconnect, which makes P2P networks very dynamic. Therefore, each Skype client must keep track of other connected super nodes in the Skype network; so that it can connect to one of them if its super node becomes unavailable. The super node is selected by the Skype protocol based on a number of factors, e.g. available bandwidth. It is not possible influence the selection of a super node.¹⁹¹

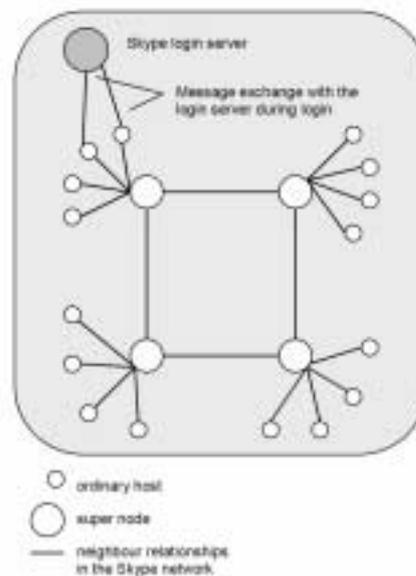


Figure 12. *The Skype network and its three main entities: super nodes, ordinary nodes and the login server*¹⁸⁹

¹⁸⁶ www.skype.com (02-03-2006)

¹⁸⁷ www.skype.com (02-02-2006)

¹⁸⁸ Singh, K., et al. (2004) p 3

¹⁸⁹ Skype (2005) p 1

¹⁹⁰ Skype (2005) p 9

¹⁹¹ Baset, S. A., et al. (2004) p 11

Although not a node itself, the Skype login server is an important element in the network. It makes the user authentication at login and ensures unique login name and password for each user. Apart from the login server, there is no central server in the Skype network, compared to IMS. All information is stored and spread in a decentralised fashion.¹⁹² The network is sensitive to failure in the centralised login server¹⁹³. For a detailed description of a Skype call session, see Appendix II.

¹⁹² Baset, S. A., et al. (2004) p 1

¹⁹³ Singh, K., et al. (2004) p 3

5 Empirical Study



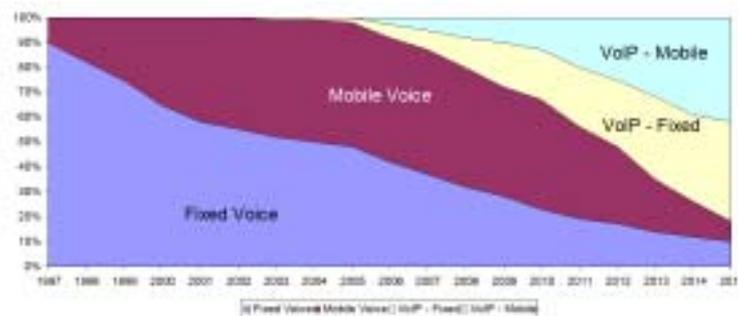
To be able to forecast and predict the potential opportunities and threats of the Telecom industry, this chapter aims to identify the current market trends and drivers, as well as KSFs. These are presented in tables at the end of each section respectively. This is followed by an internal study of Tactel, which will be the basis for their strengths and weaknesses in the analysis chapter. The empirical study ends with a study of IMS and Skype.

5.1 Telecom Market Forecast

The Telecom industry is converging with the Internet, and even the media industry. The future industry is becoming a playground for operators, handset and network vendors, as well as content and service providers.¹⁹⁴ It will become a blend of phones and television, as well as music and the Internet. The three main drivers of this market is new technology, shifting dynamics and emerging bundle segments, meaning they are tied together.¹⁹⁵

New technologies, such as IMS, are together with IP the corner stone for content and communication services. These technologies enable differentiation between companies in the attempt for attracting new customers and revenue.¹⁹⁶

Shifting dynamics, meaning that more consumers are using their mobile phones instead of fixed phones, hence the majority are shifting over to wire-less. Studies are showing that the percentage of total minutes used on voice services are shifting. By 2012, nearly 50% of all voice will be over IP, see Graph 2.¹⁹⁷



Graph 2. Illustrating percentage of total minutes used by consumers¹⁹⁸

¹⁹⁴ Huawei (2006) p 1

¹⁹⁵ A.T. Kearney #2 (2005) p 1

¹⁹⁶ *ibid.*

¹⁹⁷ Arthur D. Little #1 (2005) p 16

¹⁹⁸ Authors' own model

The service with the highest potential in this shifting environment is television. Research estimates a EUR 40 billion market for mobile television in 2010. Furthermore, the market for downloading ring tones is estimated to increase EUR 327 million, to approximately EUR 333 million by 2009.¹⁹⁹

Emerging bundled segments, is the third driver, which means offering solutions to a greater extent²⁰⁰. Studies have shown that it is bigger bundles that will drive subscriber loyalty²⁰¹. Other predictions are that multimedia mobile messaging and video streaming that will undergo one of the biggest growths, especially in 2007 and 2008. By then, one out of four users will send video messages.²⁰²

One way for operators and vendors to meet these new demands, and become a strategic winner, is to deploy a more user-centric service network. This network will consist of a horizontal architecture with a high customer focus, enabling the evolution to the all-IP network.²⁰³ New and creative services, reaching the market faster than before, will be the industry KSFs^{204, 205}.

When looking at the business customers on the other hand, the essential factor to focus on will be complete solutions rather than stand alone products. It is all about delivering enterprise solutions, which includes everything from market channels, middleware that integrates enterprise applications to the devices themselves. When comparing consumers against business customers, the latter are much more stable, which in some cases makes it a more attractive market.²⁰⁶

5.1.1 Operators

One of the most common predictions is that voice revenue will keep falling during 2006 as flat rate becomes more frequent, and alternative providers offering VoIP, such as Skype, will start taking a bigger piece of the total revenue share.²⁰⁷ Operators are forced to focus more on implementing convergent architectures, as well as multimedia services, in order to keep their revenue²⁰⁸.

Besides the fixed and mobile network convergence that the operators face, other drivers such as industry consolidation and emerging markets will play an important

¹⁹⁹ A.T. Kearney #2 (2005) p 2

²⁰⁰ *ibid.*

²⁰¹ 3GSM World Congress (2006) *A Future for Legacy Services*

²⁰² 3GSM World Congress (2006) *Kontron and Voiceage Networks*

²⁰³ Huawei (2006) p 1

²⁰⁴ Sinclair, A., *Chief Technical Officer*, GSM Association (2006)

²⁰⁵ Lewis, A., *Independent Consultant* (2006)

²⁰⁶ *ibid.*

²⁰⁷ 3GSM World Congress (2006) *Getting Connected for an FMC Future*

²⁰⁸ 3GSM World Congress (2006) *A Future for Legacy Services*

role the coming years, leading to increased M&A activity by the operators²⁰⁹. During 2005, M&A activities came back into the Telecom industry, and are predicted to grow under 2006.²¹⁰

Telenor is a typical operator interested in growth markets, and by e.g. acquiring Vodafone Sweden, Telenor has become more market-pull focused^{211, 212}. Furthermore, operators will no longer be organised depending on network access (wire-less, wire-line, data) but on telephone (wire-line/wire-less), broadband (wire-line, wire-less) and finally sales and services²¹³. Telia and Telenor are good examples of operators who are focusing on all these categories. They are so called triple-players, meaning that they can offer mobile and fixed telephone as well as broadband.²¹⁴

Some operators are focusing on differentiated content, such as Hutchison 3, but with limited success so far²¹⁵. It is also these operators, typically second or third operators on the market, who are more likely to outsource the network operations, focusing more on retaining their customer base in order to survive²¹⁶.

This means that one of the main areas for operators to focus on is the enabling of branding and the specialist services supporting it. Another area to invest in is the automation of the back-offices. This will lead to greater flexibility, getting new services out on the market faster. In the end, it all mounts out in making the customers lives easier, offering aggregated services with fewer people for them to deal with in order to get what they want.²¹⁷

This is especially important since many predict subscriber loyalty to be a key driver²¹⁸. It was a lot easier with subscriber loyalty a couple years ago, when each network operator had exclusive right to provide content and services to the end-users. Today, the subscribers have realised that this content can be found on the Internet, thus shifting the power more to the content provider.²¹⁹

Nearly 70 % of the European mobile content is purchased outside the operators' portals²²⁰. This result in decreasing loyalty towards the network operators, since

²⁰⁹ Halldin, A., *CEO & Co-founder*, Woize, 03-22-2006

²¹⁰ www.pyr.com (03-14-2006)

²¹¹ *ibid.*

²¹² Carlsson, N., *Market & Product Manager*, Telenor, 03-22-2006

²¹³ Andersson, J. S., *Software Business Manager*, Sony Ericsson, 03-23-2006

²¹⁴ Åkesson, J., *Director Sales & Marketing*, Tactel, 02-09-2006

²¹⁵ Karlsson, M., *VP Marketing*, Tactel, 03-31-2006

²¹⁶ www.pyr.com (03-14-2006)

²¹⁷ Willetts K., *Chairman*, TeleManagement Forum (2006)

²¹⁸ 3GSM World Congress (2006) *A Future for Legacy Services*

²¹⁹ www.pyr.com (03-14-2006)

²²⁰ Marcus, D., *CEO & Founder*, Echovox (2006)

unique deliverables, such as ring tones, games and videos are instead offered by content providers²²¹.

For operators to maintain their current profits, they need to offer something extra compared to the content providers²²². By reducing control over the content portals, which are more suited for content providers and companies with strong brands, operators can focus more on their core competences, such as network management, to drive up their revenues^{223, 224}. The increased content traffic will lead to greater revenues and ultimately increased subscriber loyalty²²⁵. However, operators currently have restrictions on network access and unfairly high charges for third party content and service providers²²⁶.

There are some important characteristics on the Scandinavian market worth mentioning that affect operators. One important characteristic is the operator abundance, leading to tough competition. Another is the retailers' relatively strong position, and as they represent several operators brands and mobile phone features become important differentiators.²²⁷ Currently, operators are offering subsidised handsets through the retailers, but incumbents will probably soon forbid this action, following the trends on the American market²²⁸. Consequently, operators can set demands on handset vendors regarding mobile phone features and appearance to be able to offer differentiated phones to the end-user²²⁹.

5.1.2 Other Actors

2006 is expected to be a good year for the content providers in general, and mobile gaming stands for the biggest potential growth area. The growth expectation for Europe, and hence the Scandinavian region, is nearly 400 % between 2004 and 2010. Furthermore, a 77.2 % increase in mobile gaming download each year during this period is also anticipated.²³⁰ The mobile content delivery market will reach approximately EUR 2 billion by 2007²³¹.

The actors are also starting to realise that the future lies not in network technology itself, but rather in what you can do with it. Service is the key word, and those who can manage service deliveries and rich customer experience, will be the future

²²¹ www.pyr.com (03-14-2006)

²²² Marcus, D., *CEO & Founder*, Echovox (2006)

²²³ ims-insider.blogspot.com (03-14-2006)

²²⁴ Marcus, D., *CEO & Founder*, Echovox (2006)

²²⁵ *ibid.*

²²⁶ Karlsson, M., *VP Marketing*, Tactel, 03-31-2006

²²⁷ Andersson, J. S., *Software Business Manager*, Sony Ericsson, 03-23-2006

²²⁸ Karlsson, M., *VP Marketing*, Tactel, 03-31-2006

²²⁹ Andersson, J. S., *Software Business Manager*, Sony Ericsson, 03-23-2006

²³⁰ Grundy, J., *Vice President & General Manager*, Mobility Business Group-Immersion (2006)

²³¹ www.appium.com (03-15-2006)

winners. The question arises what a company should do in order to become one of the winners of tomorrow.²³² A study showed that 43 % of the companies have shifted from a product centric approach to a customer centric approach. The majority of the other companies were in the process of doing so, or at least planning to.^{233, 234}

For instance, handset vendors are becoming much more customer focused and are entering the mobile-services arena by providing applications and services²³⁵. One reason for this could be that handset vendors are facing a slightly darker future compared to the service providers. The rate of new mobile subscribers during the period 2006-2010, will almost stagnate on the European (Scandinavian) market. During this period, the total amount of handsets sold in percentage of the average number of subscribers will be a stable 40 % per annum.²³⁶

From only providing aftermarket support for their own products, network vendors are becoming more diversified by also providing consultant and implementation services for other networks. There are several dimensions of this issue, one being that faster development of new applications will take place.²³⁷ Position changes in the value chain affect network vendors' strategic position, especially depending on whether it will be operators, which are their most important customers, or other actors supplying content and services.²³⁸ Another important trend is that network vendors are converging, e.g. Alcatel's acquisition of Lucent²³⁹.

The key driver for services is usability. For the end-user to use services on a more regular basis, and thus drive up ARPU, services need to be accessible and easy to use.²⁴⁰ It is also important to consider that it will be the market who dictates the killer application, not the service providers²⁴¹. For example, many end-users think that new mobile phone interfaces are becoming too complicated, thus only using the voice service. This results in the user interface becoming a barrier to the service market's potential growth. With an end-user approach; new mobile phones would be produced for a specific user segment with different user interfaces.²⁴²

²³² Willetts, K., *Chairman*, TeleManagement Forum (2006)

²³³ Arthur D. Little #1 (2005) p 3

²³⁴ Arthur D. Little #1 (2005) p 30

²³⁵ Li, F., et al. (2002) pp 466-467

²³⁶ Arthur D. Little #2 (2005) p 41

²³⁷ Alkio, K., *VP Consulting & Integration Services*, Nokia Networks (2006)

²³⁸ Svedberg, S., *Director – IMS – Strategic Product Management*, Ericsson, 03-22-2006

²³⁹ www.usatoday.com (04-03-2006)

²⁴⁰ LaPointe, J., *Director of Product Management*, Zi Corporation (2006)

²⁴¹ Foreman, K., *General Manager*, RealNetworks (2006)

²⁴² LaPointe, J., *Director of Product Management*, Zi Corporation (2006)

5.1.3 New Competitors

The new market will not only bring new ways of attracting end-users and increasing revenues, it will also bring new competitors into the game by 2007. The newcomers with most power will be the media companies that own their own wire-less networks.²⁴³ The new trends and techniques that will be introduced to the market in the near future will also lead to new possibilities within the mobile networks²⁴⁴.

This leaves an open door for new companies, i.e. financial institutions and Internet actors, to mobilise their services, such as data applications and products²⁴⁵. These new entrants together with the emerging technologies and industry consolidations will have a great impact on the competitiveness in the Telecom industry²⁴⁶.

A survey showed that companies in the Telecom industry viewed their strategic position and their product and service innovation, as well as customer relationship, as KSFs for competitiveness.²⁴⁷ As the market gets more competitive, the importance of a company's position increases²⁴⁸.

How companies strengthen their strategic position all depends upon size and segment. Studies have shown that smaller companies tend to build partnerships and alliances, while larger manufacturers restructure and transform their operations. Software companies on the other hand focus on targeted acquisitions.²⁴⁹ Due to the increasing competitiveness, sustainable revenues are becoming more vital, thus focusing on building deeper relationships. In the end, new business models will emerge in the new market, with a focus on extending relationships.²⁵⁰

5.1.4 Conclusion

A revenue growth at 3.3 % per annum in 2006-2010 for the European (Scandinavian) mobile sector, excluding content revenue, has been predicted. The four major growth drivers and their growth per annum in the period 2006-2010 are voice from existing customers 0.9 %, residential mobile data (SMS and new data) 7.2 %, corporate mobile data 53 % and new consumer segments (under 15 and over 65 of age) 8 %.²⁵¹ Today, 90 % of the data ARPU consist of SMS and 10 % other data. The latter number is estimated to grow to nearly 35 % in 2010²⁵².

²⁴³ A.T. Kearney #2 (2005) pp 2-3

²⁴⁴ www.pyr.com (03-14-2006)

²⁴⁵ *ibid.*

²⁴⁶ A.T. Kearney #1 (2005) p 27

²⁴⁷ A.T. Kearney #1 (2005) p 24

²⁴⁸ A.T. Kearney #1 (2005) p 27

²⁴⁹ A.T. Kearney #1 (2005) p 30

²⁵⁰ A.T. Kearney #2 (2005) p 3

²⁵¹ Arthur D. Little #2 (2005) p 4

²⁵² Arthur D. Little #2 (2005) p 63

Managing Positions in a Dynamic Environment -
New Technology Impact on Tactel and the Telecom Industry

For the operators and content providers to benefit from increased data traffic, content providers, big brands and media companies needs to provide consistent and innovative products²⁵³. For service providers to maximise their markets, they have to concentrate on their core competence whilst their partners focus on respectively competences. It is therefore essential with a network of companies with complementary competences, e.g. industrial network.²⁵⁴

The mentioned market drivers have been categorised by the authors and presented in Table 1. The operators' most important market drivers are presented first, due to their strong position and influence. They are followed by the drivers affecting the market's future growth and the drivers affecting the market today. Finally, there are two general drivers that affect the entire market and industry, presented as well in the table.

Drivers				
Operators	Network Convergence	Industry Consolidation	Emerging Markets	Loyalty
Growth	Voice from Existing Users	Residential Data	Corporate Data	New User Segment
The Market	New Technology	Shifting Dynamics	Bundle Segments	
General	Branding	Usability		

Table 1. *The different drivers of four areas*²⁵⁵

Furthermore, the authors have categorised the KSFs for succeeding in the Telecom industry and surviving competition, see Table 2.

Key Success Factors			
The Industry	New Services	Creative Services	Time to Market
Competitiveness	Customer Relationship	Strategic Position	Product/Service Innovation

Table 2. *The different KSFs*²⁵⁶

²⁵³ Marcus, D. (2006) p 70

²⁵⁴ Li, F., et al. (2002) pp 466-467

²⁵⁵ Authors' own table

²⁵⁶ *ibid.*

5.2 IMS

One big advantage with a standardised architecture, such as IMS, is its standardised components that can be delivered from an increased number of suppliers. Especially when specialist competence for circuit switched domain signalling disappears. All traffic will eventually flow through the packet switched domain, becoming all-IP, which will further reinforce the technology convergence between the Telecom and Internet industry.²⁵⁷ IMS is an architecture, which makes it hard to estimate and quantify the real benefits²⁵⁸. Even if a business case shows that it is possible to achieve cost reductions and revenue, the most important aspect is how quickly this can be converted into reality²⁵⁹.

5.2.1 Operators

According to a global survey, operators are the most influential drivers of IMS, where revenue and services are the main drivers for IMS deployment by the operators²⁶⁰. Studies are also predicting that mobile operators will dominate the IMS deployment. IMS will probably not become a part of the core network architecture until approximately 2009 and beyond.²⁶¹

To be able to deploy IMS-based services, mobile operators first have to leverage their existing large network investments. The next step is to provide seamless and secure interconnectivity between 3G networks and IMS networks. Interoperability is the last step where multiple IMS networks will interconnected.²⁶²

Operators consider the phasing out of proprietary networks, meaning more standardised networks, as vital for their competitive survival²⁶³. Network convergence is a key market driver for IMS, and for mobile operators this is primarily a way for revenue generation as new and enhanced services can be delivered faster. Mobile operators have to be sure on IMS business models and the profitability before deploying it fully.²⁶⁴ For fixed operators network convergence is important as this is a more mature market with focus on cost-reduction^{265, 266}.

²⁵⁷ Strömberg, A., *VP Products*, Appium, 03-02-2006

²⁵⁸ Apertio (2006) p 10

²⁵⁹ *ibid.*

²⁶⁰ STL Partners & The Moriana Group (2006) pp 10-12

²⁶¹ Forrester (2005) pp 6-7

²⁶² Go, P. J., *President & CEO*, Continous Computing (2006)

²⁶³ Apertio (2006) p 11

²⁶⁴ Strömberg, A., *VP Products*, Appium, 03-02-2006

²⁶⁵ STL Partners & The Moriana Group (2006) p 6

²⁶⁶ Strömberg, A., *VP Products*, Appium, 03-02-2006

IMS's success, in both technical and economical terms, is dependent on how the individual operator chooses to introduce IMS to the network²⁶⁷. Mobile and fixed operators have so far been approaching the IMS challenge from different perspectives, mostly due to differing business priorities. It is dangerous to adopt vastly different adoption routes since this will lead to confused implementations and increased complexity when analysing the IMS success and best practices. Almost 85 % of the operators see third party vendors as the preferred choice to supply IMS applications.²⁶⁸

In the rush to deliver IMS solutions, fundamental principles of the open and standardised architecture are becoming lost²⁶⁹. It is critical to have an open and standardised vision, and implementation, of IMS. Operators are still challenged by solving the IMS business case, and often try to do so by trying to develop killer applications. To win, operators should instead make a fundamental shift in philosophy and the core network architecture.²⁷⁰

This is especially important since IMS core networks is a long term investment. Even if operators only choose to release individual applications, it will still require a system update as the number of IP applications expands, creating additional cost. The winners may well be those operators who carefully plan the roll-out of IMS and not the ones trying to reach full deployment first.²⁷¹

Operators that have started the implementation, have longer return on investment (ROI) estimates than those yet to undertake the work, which suggests that there are surprises on the way that can delay the roll out. This emphasises the importance of clarity when formulating strategy and implementation plans.²⁷²

When applying ROI on IMS, several important observations can be made from a study conducted on numerous operators, see Graph 3. However, this measurement does not say whether the operator implement IMS as a strategy or just a single application, like push-to-talk, which affects the ROI.²⁷³

²⁶⁷ Apertio (2006) p 3

²⁶⁸ Apertio (2006) p 14

²⁶⁹ Wyatt, A., *VP Global Marketing*, Apertio (2006)

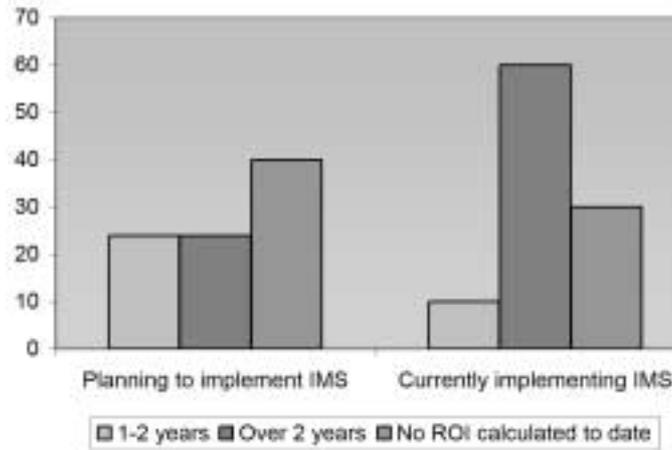
²⁷⁰ 3GSM World Congress (2006) *Apertio and Ubiquity*

²⁷¹ Apertio (2006) pp 13-14

²⁷² Apertio (2006) pp 11-12

²⁷³ *ibid.*

Managing Positions in a Dynamic Environment -
New Technology Impact on Tactel and the Telecom Industry



Graph 3. Estimated ROI on IMS, percentage of answers²⁷⁴

Two-thirds of operators are still convinced that a fundamental architectural shift is set to be underway, in a near future²⁷⁵. Almost three quarters of the responding operators will implement IMS over the next 18-24 months, in one way or another²⁷⁶. The IMS deployment is estimated to be 3-8 years and investments will amount approximately EUR 8 billion in 2008²⁷⁷.

Current IMS operators are not living up to the commercial expectations, which potentially opens up the market to new competitors. It is crucial to solve these issues, as early-adopting operators will deploy IMS during 2007 and the majority by 2009-2010.²⁷⁸ The lack of IMS based mobile handsets will prevent early-adopting mobile operators from launching IMS based services until 2007²⁷⁹. The first IMS compatible mobile handsets will reach the market by the end of 2006²⁸⁰.

One of the biggest advantages for mobile operators and end-users offered by IMS is the centralised and single subscriber profile that enables mobility across fixed, mobile and converged networks. By reducing the size and complexity of the networks, it brings forth hidden data, which enables better tracking of service usage, hence enabling billing.²⁸¹ This is important as poor subscriber data is an important factor for diminished subscriber loyalty²⁸². The next two years are critical for operators to prove

²⁷⁴ Apertio (2006) p 11

²⁷⁵ *ibid.*

²⁷⁶ Apertio (2006) p 14

²⁷⁷ www.appium.com (03-15-2006)

²⁷⁸ STL Partners & The Moriana Group (2006) p 6

²⁷⁹ STL Partners & The Moriana Group (2006) p 22

²⁸⁰ Åkesson, J., *Director Sales & Marketing*, Tactel, 02-09-2006

²⁸¹ Wyatt, A., *VP Global Marketing*, Apertio (2006)

²⁸² Apertio (2006) p 6

that IMS indeed is the success they so much need, resulting in cost reduction and revenue increase²⁸³.

For IMS to become a success, operators need to start relating technology advances to actual customer needs. They have to be better at deploying new technology and abandon technology push for market pull oriented strategies. IMS is a way for operators to maintain their strong position within the network and control the traffic in their networks. However, operators can still block unauthorised data in their networks without IMS, even if it is less accurate.²⁸⁴

5.2.2 Other Industry Actors

There are two main drivers for IMS, the network convergence and the need for new data services in large scale. IMS is currently the only global standard for achieving this²⁸⁵. However, this would allow anyone to build an IMS network with best-of-breed products. For network vendors to assure their position, they are providing their own IMS solutions, which will result in different IMS networks.²⁸⁶

Currently, network vendors decide on how to implement IMS components. The reason is that IMS is a standard that is still evolving and is based on technology that is not yet proven, thus the standardisation bodies only define the reference architecture. The hardware and implementation methods differ, introducing risk to the mobile operators that is eliminated through single supplier agreements.²⁸⁷

There is no single body to ensure interoperability, which limits the success of best-of-breed vendors and favours the big network vendors²⁸⁸. Ericsson is believed to be the market leading IMS network vendor, followed by Lucent as a good number two, with IBM and HP as the major providers of IT solutions to the networks²⁸⁹. For example, IMS is a way for Ericsson trying to find new ways for operators to raise revenue²⁹⁰. Ericsson is promoting IMS by including a free IMS framework in all its mobile platforms²⁹¹.

A key issue for successful IMS implementation is the creation of flexible networks that are able to respond to customer demand²⁹². Whether IMS becomes a success or not, depends on many factors, not least on how operators go about implementing

²⁸³ Apertio (2006) p 14

²⁸⁴ ims-insider.blogspot.com (03-14-2006)

²⁸⁵ STL Partners & The Moriana Group (2006) p 9

²⁸⁶ Strömberg, A., *VP Products*, Appium, 03-02-2006

²⁸⁷ Forrester (2005) p 5

²⁸⁸ *ibid.*

²⁸⁹ STL Partners & The Moriana Group (2006) pp 26-27

²⁹⁰ Åkesson, J., *Director Sales & Marketing*, Tactel, 02-09-2006

²⁹¹ Svedberg, S., *Director – IMS – Strategic Product Management*, Ericsson, 03-22-2006

²⁹² Wyatt, A., *VP Global Marketing*, Apertio (2006)

IMS²⁹³. Mobile operators that have started implementing IMS, finds it to be a much tougher challenge than expected, which can be explained by the fact there is currently nothing on the market that can be defined as true IMS²⁹⁴.

5.2.3 Conclusion

The most important driver of IMS is technology, as it supports the all-IP vision. The drivers behind this vision is network convergence between wire-line and wire-less networks as well as the vision where media can be used in a more flexible way in a session. IMS would give the Telecom industry the ability to benefit from the Internet industry's flexibility and innovation, but with sustained Telecom values; security, control and interoperability.²⁹⁵ By adopting IMS the networks will become centralised systems controlled by operators, which will prevent third part suppliers, such as pay-pall suppliers²⁹⁶.

The biggest challenge for a successful implementation of IMS resides in organisational, rather than technological changes²⁹⁷. Thus, the most important success factor is creating an IMS friendly environment at the core of the networks²⁹⁸. Furthermore, IMS has to be implemented with a strategic perspective and not with an application focus, even though this is compelling in the short term²⁹⁹.

IMS, like many of its forerunners, have a lot to prove before succeeding. Even though the technology behind IMS is not entirely new, the architecture still offers a new and interesting alternative to manage subscriber data. This change might very well be one of the most important issues on the Telecom industry today, since customer demands are increasing rapidly alongside the emergence of new data services.³⁰⁰

One of the industries strengths is the ability and success to, eventually, create interoperability. This speaks in favour of IMS, being the agreed way forward in the industry, and there are currently no alternatives to the concept behind the IMS architecture³⁰¹. Few argue on the logic of an open, modular network. However, on the short term, IMS is immature.³⁰² To become a success, IMS has to be user-friendly, offering attractive and demanded services at competitive prices³⁰³.

²⁹³ Apertio (2006) p 14

²⁹⁴ Wyatt, A., *VP Global Marketing*, Apertio (2006)

²⁹⁵ Svedberg, S., *Director – IMS – Strategic Product Management*, Ericsson, 03-22-2006

²⁹⁶ Andersson, J. S., *Software Business Manager*, Sony Ericsson, 03-23-2006

²⁹⁷ Apertio (2006) p 12

²⁹⁸ Apertio (2006) pp 11-13

²⁹⁹ *ibid.*

³⁰⁰ Apertio (2006) p 15

³⁰¹ Svedberg, S., *Director – IMS – Strategic Product Management*, Ericsson, 03-22-2006

³⁰² Forrester (2005) p 5

³⁰³ Strömberg, A., *VP Products*, Appium, 03-02-2006

The identified and described market drivers are presented in Table 3. They are categorised by the authors, regarding the general market drivers, followed by the drivers for the operators and finally the network vendors.

Drivers				
General	IP networks	Network Convergence	Multimedia	Operators
Operators	Services	Revenue/Cost Reduction	Control	
Network Vendors	Data services	Technology		

Table 3. *The different drivers*³⁰⁴

There are several important KSFs for IMS, summarised and categorised in Table 4. They are divided into three different areas; IMS deployment, IMS success and operators.

Key Success Factors			
IMS Deployment	"Standard" Introduction	Operators	Flexible Core Networks
IMS Success	IMS Friendly Environment	Support Next Gen. Services	
Operators	Open Vision	Standard Vision	

Table 4. *The different KSFs*³⁰⁵

5.3 Skype

In 2005, Skype had more than 75 million registered PC users and 2006 is set to be the year when Skype goes mobile³⁰⁶. eBay's acquisition of Skype for an amount close to EUR 4 billion, signals the arrival of VoIP to challenge mobile operators and their business models. VoIP has already had profound affect on fixed operators and now it is the mobile operators turn to accept that subscribers are going to demand wire-less

³⁰⁴ Authors' own table

³⁰⁵ *ibid.*

³⁰⁶ 3GSM World Congress (2006) *Skype Goes Mobile*

VoIP services.³⁰⁷ There are currently about 1 700 VoIP applications on the market, and even operators are starting to release their own VoIP application, e.g. Tele2's Parlino service^{308, 309}.

Until now, mobile operators have always had a privileged position on the Telecom industry, where voice revenues accounts for up to 85 % of total revenue. The arrival of IP services means that operators are rushing to implement IMS to protect their revenue. Instead, operators should see the opportunities presented by wire-less VoIP.³¹⁰

Hutchison 3's European mobile division will shortly bundle Skype's new mobile client for Microsoft Windows Mobile smart phones, and what is more important, with flat-rate data tariffs.³¹¹ However, it is currently not possible to download a Skype client for a regular mobile phone; it has to be built in by the handset vendor³¹². Hutchison 3 seems to believe that voice is or will be free and that only pricing similar to Internet service providers will accelerate the mobile data usage. Furthermore, they believe that Skype's strong brand will be worth the loss in voice revenue.³¹³

For mobile operators, this opens up the opportunity to access Skype's community, which is growing steadily all over the world. With packages and subscription plans that include the Skype brand, which complements Hutchison 3, operators will hopefully be able to attract new subscribers and introduce other value-added services.³¹⁴

Skype's client for mobile phones is available for free on the company's website and with a successful launch of Skype; a wedge of voice traffic will be transferred from the circuit-switched domain to the packet-switched domain via the UMTS data bearer.³¹⁵ Within the next 12 months, mobile operators will have to respond effectively to break the Internet actors' strategy to get around them, and by doing so gain bargaining power in future cooperation negotiations.³¹⁶

³⁰⁷ Nordström, B., *Chief Strategy Officer*, inCode (2006)

³⁰⁸ www.voipproviderslist.com (04-11-2006)

³⁰⁹ www.di.se (05-02-2006)

³¹⁰ Nordström, B., *Chief Strategy Officer*, inCode (2006)

³¹¹ 3GSM World Congress (2006) *Hutchison Goes VoIP in Skype Partnership*

³¹² Johansson, D., *Product Manager*, Tactel, 02-10-2006

³¹³ 3GSM World Congress (2006) *Hutchison Goes VoIP in Skype Partnership*

³¹⁴ 3GSM World Congress (2006) *Skype Goes Mobile*

³¹⁵ 3GSM World Congress (2006) *Hutchison Goes VoIP in Skype Partnership*

³¹⁶ ims-insider.blogspot.com (03-14-2006)

5.4 Tactel

“Tactel is a leading developer of mobile applications, providing solutions and consulting services to many of the world’s major network operators and mobile handset vendors. We help these customers stay ahead of the game by designing genuinely original applications, and making sure they work on all networks and with all handsets.” – Tactel’s Mission Statement³¹⁷

Tactel is an entrepreneurial and innovative company with a good and reliable track record³¹⁸. The company was founded in 1995 and had annual sales of approximately EUR 30 million 2005, enjoying an annual compound growth rate of 85 %, since 1998^{319, 320}. It is a medium sized company with approximately 150 employees and growing, with offices in Malmoe, Huskvarna and Lund. Tactel has organised its sales activities around two customer segments, handset vendors and operators, see Figure 13³²¹. Tactel provides three types of consulting services, Insourcing, Outsourcing, and Solutions. All provided to handset vendors, the two latter ones only to operators.³²²



Figure 13. Tactel’s organisation chart³²³

That is why Tactel could easily double its activities due to the increasing amount of assignment requests³²⁴. However, the company has a pronounced strategy, even though their way to it sometimes is a winding road, and is currently looking for new customers like Sony Ericsson, which currently stands for more than 50 % of the

³¹⁷ Henriksson, P. (2005) p 3

³¹⁸ Henriksson, P., *CEO & Co-founder*, Tactel, 03-21-2006

³¹⁹ Henriksson, P. (2005) p 3

³²⁰ www.tactel.se (03-20-2006)

³²¹ Henriksson, P. (2005) p 11

³²² Karlsson, M., *VP Marketing*, Tactel, 03-31-2006

³²³ Henriksson, P. (2005) p 11

³²⁴ Karlsson, M., *VP Marketing*, Tactel, 03-31-2006

turnover³²⁵. The most important business drivers for Tactel is profitability that is primarily used for organic growth, followed by networking and industry knowledge and finally the creation of a challenging and fun environment for its employees³²⁶.

The ideas behind the products developed by Tactel often come from ideas emerging when working with its customers. If it is a potential order winning product, then Tactel often develops the product as a consultant assignment for the specific company. Otherwise, Tactel develops the product and market it as its own as this leads to lower prices for the customer. Mobical, a sync management product developed by Tactel, is sold to e.g. both Sony Ericsson and Ericsson.³²⁷

Continuous and clear strategies are important for a unified business methodology, and this is an area of improvement for Tactel³²⁸. It is important to have a similar roll in the projects conducted, independently of the customer³²⁹. They have realised this and are now implementing a company wide business strategy. In practice this means that Tactel will sell solutions at a fixed price and then sell additional integration and consulting services for adapting the product to match the preferences of each customer. With increased service and integration assignments the relationship to their customers will grow stronger.³³⁰

5.4.1 Resources and Competences

The personnel and management team are the single most important resources for Tactel. Tactel delivers end-to-end solutions, meaning that their applications work on all platforms and mobile handsets, which requires broad and deep competences.³³¹ Furthermore, Tactel has competence groups that evaluate new technology³³². Tactel's most important competences are their culture, diversity and their drive for business, which makes the recruitment process important³³³. The company also has some IMS competence as they currently are developing an IMS based poker client³³⁴.

Already in the times when Tactel was recruiting its first employees there was a clear focus on finding business driven employees that would complement the existing resources within the company. There is still room for more sales and marketing focused personnel to complement developers, as it is important to have a balance

³²⁵ Henriksson, P., *CEO & Co-founder*, Tactel, 03-21-2006

³²⁶ *ibid.*

³²⁷ Johansson, D., *Product Manager*, Tactel, 03-20-2006

³²⁸ Henriksson, P., *CEO & Co-founder*, Tactel, 03-21-2006

³²⁹ Johansson, D., *Product Manager*, Tactel, 03-20-2006

³³⁰ Henriksson, P., *CEO & Co-founder*, Tactel, 03-21-2006

³³¹ *ibid.*

³³² Karlsson, M., *VP Marketing*, Tactel, 03-31-2006

³³³ Henriksson, P., *CEO & Co-founder*, Tactel, 03-21-2006

³³⁴ Finander, L., *Software Engineer*, Tactel, 02-08-2006

between business and technology, as well as everyone having the same business mindset.³³⁵

For a consulting and service company like Tactel it is important to avoid being an abstract supplier. To be able to offer concrete products it is crucial to have business methods. Every step has to be documented and organised so that the different parts in an offer are concrete with the possibility to quantify cost. Methods are a way to packet competence that, together with references, builds the company image. References are the most important factor influencing Tactel's strategic position within the network.³³⁶

5.4.2 Relationships

Many of Tactel's customers are big, global actors, especially on the handset vendor segment³³⁷. In the Telecom industry the negotiation process takes at least 3 months, but on average about 6 months, between initial contact and the first deal³³⁸. Thus, the most important thing for Tactel is to maintain their current relationships, but they need at least two new customers to be able to maintain their growth rate until 2008³³⁹. When choosing a customer or partner it is the business potential that decides, not size. However, being a medium sized company, Tactel has limited resources and hence has focus on selected relationships, which often means bigger customers are chosen as they have bigger business potential.³⁴⁰

With more than 50 % of Tactel's turnover, Sony Ericsson is the single most important strategic relationship. However, there is currently nothing preventing Tactel from working with other big actors in the future, like content providers. Operators is another important relationship, today Tactel conducts businesses with 8 operators hoping to increase this number to become 12 before the end of 2006.³⁴¹

As the organisation has grown larger and become more mature, it is important to have more professional relationships. Customers have to be met by a team where every person has a distinct role, this is especially important for outsourcing and solutions as these demand a more complex sales process.³⁴²

Within Solutions the old business model, based on revenue from royalties, is gradually being replaced by selling a license for a fixed amount. Further income will derive from services for additional services like integration and support. However, the

³³⁵ Henriksson, P., *CEO & Co-founder*, Tactel, 03-21-2006

³³⁶ Karlsson, M., *VP Marketing*, Tactel, 03-31-2006

³³⁷ Henriksson, P., *CEO & Co-founder*, Tactel, 03-21-2006

³³⁸ Johansson, D., *Product Manager*, Tactel, 03-20-2006

³³⁹ Karlsson, M., *VP Marketing*, Tactel, 03-31-2006

³⁴⁰ Henriksson, P., *CEO & Co-founder*, Tactel, 03-21-2006

³⁴¹ *ibid.*

³⁴² Karlsson, M., *VP Marketing*, Tactel, 03-31-2006

Managing Positions in a Dynamic Environment -
New Technology Impact on Tactel and the Telecom Industry

priority is on increasing its customer base, which hopefully will spread Tactel's reputation, leading to more business, and not to maximise revenue. Lately, Tactel has faced an increase in the number of assignment requests, especially from its biggest customers, Ericsson and Sony Ericsson. At the moment Tactel can not accept all the requests and therefore prioritise Outsourcing with current customers.³⁴³

³⁴³ Henriksson, P., *CEO & Co-founder*, Tactel, 03-21-2006

6 Analysis



The aim of the analysis is to find answers for the problem discussion in Chapter 1, resulting in the recommendations found in Conclusions. First, an analysis of the Telecom industry's actors and their positions is conducted, with focus on operators, followed by the impact of IMS and Skype. Finally Tactel's future options are analysed along with the presented theories.

6.1 The Telecom Industry

What is the forecast for the Telecom industry, with focus on its main market drivers and actors?

The Telecom industry was until recently a protected industry with vertically integrated value chains, dominated by a few actors, often operators. Eventually, the deregulation opened up the Scandinavian market for competition. Another important trend is technology convergence, which allows actors from related industries, such as the Internet industry, to enter the market and brake up established value chains. Furthermore, the consumers are getting more sophisticated, knowing more what the technologies can offer them, and thus setting higher demands. In order to meet the new competition and demands, the Telecom industry is adopting Internet based technologies to reduce costs, as well as offer more attractive services (i.e. becoming more market-pull oriented). This reinforces the fusion between the two industries, and creates a highly competitive network.

The Internet has significantly reduced transaction costs due to the increasingly free and accessible information. Furthermore, the relatively low investments necessary to become for instance a game or music provider, means that important entry and mobility barriers are being torn down. Overall, the result is an increase in the number of entry points into this network, resulting in a more competitive environment and at the same time shifting the different actor's relative importance in the industry. The increase in competition leads to falling prices for end-users, relatively service performance. Therefore, it is likely that the industry consolidation will continue, especially for operators but also for service providers, seeking economics of scale to reduce cost.

During convergence between the Telecom and the Internet industry, the boundaries between value chains are fading, creating value systems of intertwined value chains from different segments. The outcome is a complex network of actors and relationships. The different value systems within the network vary depending on how you choose to define the market or industry. An interesting observation is that the difference between them is fading. For example, one value system could be the smart phone segment, which is using operating systems inspired by the PC world, e.g. Windows Mobile. In other words, it is no longer about a single company or value

chain, but rather about value systems that create value to the end-user and where the different actors complement each other. The pursue of more effective technologies and business solutions are typical characteristics for emerging value systems found in networks where a multitude of market entry points exist.

New technologies are exactly what can be found in the Telecom industry as an important driver, along side with shifting dynamics and bundling offers. These drivers result in the fact that new and creative services becoming KSFs for the industry. This might become a dilemma for some companies since not all of the companies *per se* are directly involved with the end-user, but their customers might be and therefore creative services are still a KSF for both parties. Business customers on the other hand are starting to look for complete solutions from their partners and suppliers. This means that a company should be able to offer its business customer everything from a product, to providing consultant and implementation services. Another difference between consumers and business customers is that the latter are more dependent on reliability and have more complex needs than the majority of consumers.

Product and service innovation plays an important role when, for instance, dealing with these business customers. It is also one out of three KSFs when it comes to competitiveness in the Telecom industry. The strategic position within the network is considered to be another of these KSFs. The third one is relationships, which plays an important part for the actors when trying to obtain an attractive position in the network. Industrial networks are useful for analysing these business relationships, when in the process of value creation for end-users. Furthermore, these relationships are important for a company's competitive advantage as well as creating certain structure within the dynamic network.

There are several ways of looking at this structure. If the industry agrees upon a standardised architecture it will increase reliability, interoperability, and network convergence, leading to shorter time to market. As it is today, there is a trade-off between time to market and standardisation. Since short time to market is a KSF for the industry, standardised products and services are often neglected. In the long run the introduction of a standardised architecture would decrease the overall time to market and benefit industry productivity.

6.1.1 Increased Competition

At the same time, customers are demanding richer offers, making it possible for new actors to come into the picture. This means that companies, who prospered as single suppliers to customers and end-users, now could face a new position as one of many suppliers to a single customer. The result might be that the company loses its strategic position or experience a drop in revenues, since the new actors would offer substitute products or services.

Common for all companies is the pursuit of securing ones strategic position and sustainable revenues as competition increases, thus increasing the importance of building deeper relationships. However, it is not possible to have a sustainable competitive advantage in the Telecom industry's dynamic environment. Since a company's relationships are the foundation for its position within the network, and the position itself makes up the competitive advantage, co-evolution and interdependency are vital for a company's survival.

It is therefore essential for a company to carefully choose its partners and customers, analysing the different relationships, in order to look for synergies. These synergies will affect a company's ability to act, and is also determined by the resources and the ongoing activities of each involved company. This means that changing position within the network to increase the competitive advantage, is a major activity, and is only achieved in the long run. It is therefore vital for companies to look further down the line, even though it is a highly volatile market, where business models and technologies keep changing.

Both time and commitment are required to hold a network position, and there is still no guarantee for success retaining an attractive position. The best way to increase the chances is to have a diverse relationship portfolio. However, for smaller companies, more stable relationships with bigger actors are to be preferred, focusing on a few rather than have several loose relationships. This is also due to the resources needed for establishing and retaining relationships, so for a smaller company it is better to focus on selected relationships. Furthermore, this enables tighter relationships, which means greater interdependency between existing actors, increasing the barrier of entry for new actors.

6.1.2 The Operators of Tomorrow...

The operators on the other hand, focus more on the implementation of converged networks and consolidation between each other, in order to provide multimedia services and prevent a decrease in revenue. There are several reasons for this decline, deregulation and increased competition in a more mature market is one, and a decrease in loyalty related to content another, since the same content can be found for free on the Internet.

It could be said that the operators possess a privileged position in the Telecom industry, especially mobile operators that to a great extent are involved in the entire network. They influence network vendors, handset vendors, service and content, and last but not least, end-user behaviour, see Figure 14. However, not everything speaks for the operators. In the future, subsidised handsets by operators are most likely to be forbidden by incumbents on the Scandinavian market by the European Union. The result will be that operators have to rethink their current relationship with retailers, even shifting their position. This will affect operators as they will not be able use attractive prices on handset for customer loyalty through subscriptions. Furthermore,

operators will no longer be able to put restrictions on handset performance and differentiated handset features. For handset vendors, this means that their biggest customer (relationship II) will diminish or disappear; meaning that only relationship left will be with end-users and retailers (relationship III), see Figure 14. Even though relationship II may disappear in general, there will still be a need of information flow between the two actors, regarding their e.g. customers and market. The turnover of handsets will probably decrease as end-users now have to purchase the handsets separately.

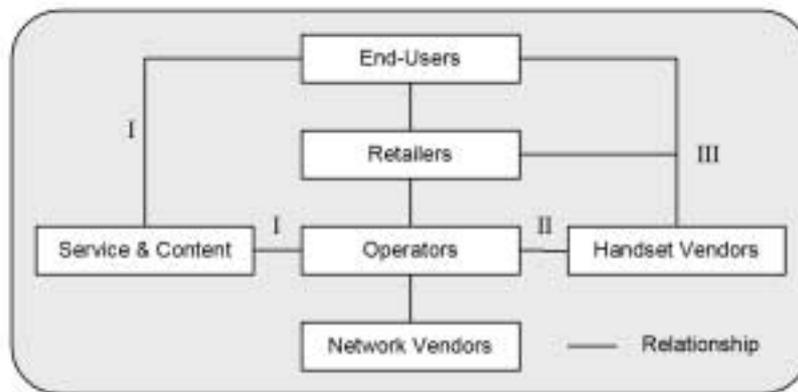


Figure 14. Schematic picture of the relationships between certain Telecom industry actors³⁴⁴

In conclusion, it could be said that the operators will not necessarily retain their dominant position that they have today within the network. Operators are looking at several different options, such as becoming bit-pipe providers or offering differentiated services. The most plausible alternative is for them to become bit-pipe providers, outsourcing content and service to third parties, and focus on their core competences of being network management. It can be compared with today's broadband operators where the end-user enjoys unlimited network access for a fixed, monthly fee. Operators becoming bit-pipe providers are dependent on offering converged networks in order to reduce cost and maximise network utilisation and cost reduction. A converged network is the number one driver for operators.

6.1.3 ...and the other Industry Actors

One possibility for the handset vendors, if subsidised handsets are forbidden, is that business customers will be more eager to replace their mobile phones than the private consumer (comparable to the PC market). This means that mobile phones may become more segmented and more dependent on differentiation. For example, high performing phones for the business segment with possibilities to run VoIP applications and adapted software for different mail programs, and simpler phones for

³⁴⁴ Authors' own model

the consumer market. Consequently, handset vendors will become more customers focused, providing more applications and services.

Network vendors are moving one step closer to the end-user, offering consultancy services in addition to hardware to their customers. Their range of services is growing wider and this is an interesting area for other industry actors offering applications and consultant services. Furthermore, they are very dependent on operators, as they decide the network features. By offering more extensive services to the operators, they will move one step forward in the value chain.

Services in general have a great potential in the future, and the key drivers for this segment are branding and usability, meaning that a service should be appealing and easy to change after the end-user's own preference. It is an important factor to consider when there is need of increased customer focus. Providing services is a way for companies in other industries to market themselves. For instance big companies such as Calvin Klein with competence in customer behaviour, can reach out to their customer base, e.g. by offering discounts over the phone. The market and end-user preferences are crucial and these actors have a competitive advantage in this segment with their knowledge in what end-users demand and how to develop attractive services. By offering services that can be altered, depending on customer segment, is a good way of securing the success of the service. In most cases, Internet actors just have to adapt their product to the mobile world, but this requires specialist competence.

The content and service market is held back by the fact that they have to be adapted to all existing regular mobile phones. In contrast, this barrier of entry does not exist in the Internet industry, where there currently only are very few platforms, e.g. Microsoft Windows, MAC OS and Linux. The situation in the Telecom industry is comparable to silos, where the architecture is vertically integrated and requires adaptation for each added service and device. The technologies behind these silos differ between handset vendors, phone models and networks. Another fact that is holding this market segment back are the high prices charged by operators, as content and service providers are dependent on them to deliver their products to the end-user, see Figure 14 relationship I. These two relationships are dependent on each other and can be regarded as one.

However, the future for content providers looks bright, and for those who manage to tailor their content according to demography, will experience good revenue potential. The content segment will face a high growth rate until 2010, especially branded content. Furthermore, a KSF for the industry are services, and the mobile network success will depend on the services it can deliver to the market. Service and content providers should not try too hard to develop a killer application, but let the market decide what it wants. Usability is the most important feature to bear in mind.

Overall, multimedia will undergo a fast growth, especially the mobile TV segment, services for downloading music and ring tones, and video streaming. The mobile TV segment alone will be worth EUR 40 billion in 2010, which is equivalent to more than 50 % of voice revenue the same year. The strongest actors to enter the Telecom industry will be media companies, and if they decide to acquire networks, they will become a serious threat dominating the industry. Other potential entrants will be financial institutions and IT companies, interested in using mobile handsets as platforms for their services and products.

In conclusion, Internet applications, content and services, will have to be adapted for the mobile world, thus opening up new opportunities for actors with mobile specialist competences. The industry is undergoing a natural phase as the market still is immature, thus attracting new actors from related industries. However the industry is moving towards a more mature phase within the next five years, leading to consolidation and cost focus.

6.2 IMS's & Skype's Affect on the Operators

How does IMS affect the operators' strategic position and how will technologies, such as Skype, influence this?

When analysing the affect of IMS on the operators' strategic positions, the chosen method is to see how well it matches the operators' main market drivers: converged networks, industry consolidation, emerging markets, and loyalty.

A converged network is the most important market driver for operators. Primarily, it is a way to offer end-users added value with enhanced services. IMS is a way for fixed operators to reduce cost on a mature market segment. It is also a way for mobile operators to generate profit now, or to prepare for the market to mature that will occur around 2010, where focus will be on lowering cost. The result is a range of new opportunities for the operators to compete and maintain their strong position against new competitors, such as Skype, by letting them control the traffic in the network as well as offer new and enhanced services. IMS is also a way of converging the Telecom and Internet industry as it supports IP and horizontal architectures.

Furthermore, the industry is consolidating; big operators are becoming triple players, such as Telenor who recently acquired Vodafone Sweden, in order to achieve both economies of scale and a converged network. If, and when, IMS becomes the accepted technology and standard in the Telecom industry, these consolidations will become much more effective when seeking synergies, as well as time and cost reduction. Applications will be developed for a single platform. This can be compared to the single operating systems in the Internet industry, where almost all PCs use Microsoft Windows, thus only making it necessary to test applications on this platform. The point is that the Telecom industry as a whole would benefit from a standardised architecture, even if it would harm for instance the operators' position.

Standardised architecture and components mean reduced cost for building the networks. Networks are often supplied by only one network vendor, making operators dependent on handset vendors to some extent. With IMS, all network components will be standardised, making it possible for operators to buy “best of breed” networks. A standardised network also means that it would become cheaper to develop services and adapt content, since there would only be one standardised platform. However, this benefit only emerges if all operators opt for IMS.

Emerging markets is the third market driver as IMS will open up the door for new markets, such as multimedia. Since operators are losing revenue from their voice service, they have to start focusing on other areas for revenue generation. Multimedia is the perfect example for doing this, especially since the growth predictions for this market is high until 2010.

Customer loyalty is the last main market driver. One of the biggest advantages with IMS is that it enables a single subscriber profile, bringing forth hidden data, increasing the tracking possibilities of service usage for operators. Better subscriber data is an important factor in increasing the loyalty for an operator, which is currently diminishing. Furthermore, IMS can offer more tailored offers for each customer, increasing the usability and so the loyalty towards the operator offering this. Other important factors that favour IMS are support, reliable networks and billing.

6.2.1 Operators' Different Options

Operators are currently in a structural hole where they control the networks and the provided content and services by charging high fees, or by blocking unauthorised data. There are several presentable options for the operators to compete in the future, and IMS can be seen as a way for the operators to keep the position they have today.

The most plausible alternative as mentioned previously in this chapter is for them to become bit-pipe providers. With IMS, operators will be able to monitor network activity and end-user behaviour. This means additional business for operators as they can provide additional services, especially to third party content and service providers. A content provider may use operators for e.g. billing management, or obtaining statistical data.

With new strong actors entering the market from the Internet industry, whom are offering attractive services and business models, operators must protect their position and profits. This is yet one more reason for them to focus on their core competence, which is network management, possibly in combination with support and customer service. New actors, with Internet based services, have a competitive advantage in their services, since they are developed for the global market and architecture, and competing globally with local operators, which have invested in expensive networks. Operators should be interested in supplying branded content and services, especially if they become bit-pipe providers with IMS, since this will be an important

differentiation possibility. Two other important differentiators will be network reliability and support.

A second alternative is that operators will not be satisfied by just becoming bit-pipe providers. They will create their own networks, blocking unauthorised data traffic like Skype, by using a centralised architecture like IMS, which enables operators full monitoring over the network traffic and their subscribers. IMS applications will become a differentiator, but only useful within a particular operator's network as long as not all operators have implemented IMS. However, if all operators opt for IMS, it will for instance make it difficult for content and service providers to get around the operators strong position in the network, as they will have to connect to the operator network in order to reach the end-users. Whether there will be a fee for this, or if the operators will simply offer additional services to their suppliers, like traffic statistics, it will still put the operators in a control position.

6.2.2 The Risk with IMS for the Operators

However, new technology does not emerge without uncertainties or complications. Since IMS in a way is both new standardised architecture and technology, it is becoming a much tougher challenge for the operators who are currently implementing IMS, than expected. Another big anchor is the large investments needed. Operators should leverage their existing network investments before jumping onto the IMS wagon. However, if they chose to roll-out IMS anyway, it is important that all operators have an open and standardised vision and implementation of IMS. Otherwise the risk for confusion and increasing complexity is overwhelming when having different adoption routes. IMS has to be viewed at in a strategic perspective, and not only with a focus on applications.

So far, all attempts to build a global standard in the Telecom industry has failed as the industry has not "walked the extra mile". This means that the standards agreed upon in the industry are too general, leaving space for individual interpretations and further developments. There are always incentives for industry actors to develop their own standard as this gives them opportunities to technology lock-in and increased market power. This has been the "strength" of the Internet industry, where one big actor has enjoyed the privilege of dominating the market with their operating system. Therefore, a single platform market, or operating system, means that the applications and services work on almost all PCs. In the Telecom market, no actor currently enjoys enough power over IMS to push it out on the market as a homogeny standard. IMS is a big silo, and if adapted by all actors, would mean that the Telecom industry would enjoy the same privilege as the Internet industry in this case. If the market leader in handset, in this case Nokia, decides to push out a standard it could have a similar effect as for Microsoft.

Everything is pointing towards IMS entering the Telecom market, the question is how big the market impact will be and how it will affect operators' position within the

network. But it is probably not enough with a few IMS applications or services; it has to be a core network supported by all operators. Those in favour of IMS advocate that end-users would benefit from this as the network would become more user-friendly and offer demanded value-added services. An important aspect is how the high implementation cost associated with IMS will affect the prices for end-users and business models for the services provided. The first services and marketing are important for a fast transition to the new IMS networks, as a long roll-out threatens to weaken the operators' position within the network. Operators should not compete with specialised actors in the value system as the industry will benefit if actors focus on their core competences. The single subscriber database in IMS will enable operators to have full insight in their networks and can use this for controlling the traffic.

6.2.3 Skype

Another reason for the operators' weakened position mentioned earlier in this chapter, is the fact that new entrants, such as Skype, are starting to provide VoIP. This can be one explanation why so many operators, by trying to protect their revenues, already have accepted, and started to implement IMS. The operators seem to use IMS as a tool to break the Internet actors' strategy to get around their strong position, and taking a piece of the action. Eventually, they will not be able to stop these new actors, but they need more time to find and adapt for new strategies and business models.

Furthermore, operators' high capacity data networks are not being fully utilised as customers prefer traditional voice over other services, not necessarily because they do not demand services but because they currently are expensive or unattractive, maybe even both. The dilemma is that operators currently cannot set the data traffic free as it would mean the end of their glory days, enabling Skype to enter their holy grail, voice. Blocked data traffic is currently an important factor preventing Skype from competing with operators as voice providers. In time, all voice will be VoIP, but before this can happen, QoS has to be improved and operators need to reorganise and prepare for alternative strategies and business models for revenue generation. Skype's business model is based on free calling between Skype-users and low rates to other users, whilst the client itself can be downloaded for free. Instead of re-thinking their current business models, operators are already rolling-out or planning for new networks that are better suited for services, meaning additional cost to already troubled financial statements.

By 2012 50 % of the voice traffic will be VoIP, but currently the reliability for mobile voice is higher over the circuit switched than for the packet switched domain. The linear increase in VoIP 2005-2010 is equivalent to the linear increase in mobile voice 1997-2001. There are new protocols that give priority to voice, which will be an important breakthrough for Skype and its ability to compete against traditional voice when they reach the market. The fact that Skype was bought by eBay shows that big

Internet actors are interested in leveraging their brands and services in the Telecom industry.

When Hutchison 3 offers mobile data traffic at flat rate, it will probably speed up the demand for media services. End-users will probably be surfing the Internet to a greater extent with their smart phones and will enjoy the possibility to download Skype, if it is not already pre-installed in the phone, and use it as they wish. But how attractive will this service be since it will be free, or almost free, to call anyway with flat rate on voice? It would probably be attractive for free international phone calls to other Skype users, and the rate for international phone calls will drop overall. For the operator it will mean, in addition to increased demand for their services, access to Skype users and differentiation with an established VoIP brand.

There are many VoIP suppliers, so there is no need for operators to develop their own applications. However, some operators choose to develop their own VoIP clients, probably to reduce the dependence towards established VoIP providers. A major advantage for Skype is that it is a global service based on Internet technology. Furthermore, there is no additional cost for producing or setting up an additional unit once it is developed. Skype is a strong brand with a large user base. Currently they have to be adapted to each mobile platform, which varies between handset vendors and models. In comparison, there are only three versions of the Skype-client for the PC industry. A drawback for Skype in the mobile world is the relatively high amount of data required and that it is only free when used between Skype users.

6.3 Tactel

Given the outcome in the previous section, is it interesting and likely for operators to invest in IMS, and how will this affect Tactel's future business and customer relations?

6.3.1 Will Operators Invest in IMS?

IMS can be seen as an introduction of the next generation networks, where everything will become more standardised and executed on horizontal layers based on IP. The Telecom industry is still in the existing technology s-curve, which is portrayed by the 3G network, but is moving closer and closer to the next technology life-cycle. In it, IMS can be regarded as the first product life-cycle needed for the transition. However, when looking closer at IMS, one could also consider the IMS architecture itself to be a new technology life-cycle, and features such as push-to-talk to be the equivalence to a product life-cycle. In other words, how a company should act upon the emerging IMS architecture, all depends on what perspective they have towards it.

Another interesting fact is that the transition does not have to transpire in one single step. Initially, other emerging technologies may slow down the transition towards IMS, such as protocols that give priority to VoIP, acting as sustaining innovations.

Even stand alone IMS features, such as push-to-talk that might be introduced by the operators, could prolong the existing networks life-cycle, by acting as sustaining innovations. All these innovations can, although at a later stage when IMS is implemented, act as complements to the new architecture.

It is essential to start analysing the different ways IMS might play in the future. One consideration could be that the best technology does not always win in the Telecom industry, it is a matter of technology push, and the big actors in the Telecom industry have decided to deploy IMS. Thus, the industry development is to great extent dependent on actions taken by big and influential industry actors. Therefore, a smaller company should monitor the activities of these actors, and maybe even grow a relationship with a selected few. It is important for a company to understand the possible products based on IMS.

There is no doubt operators will invest in IMS, the question is rather how extensive investments each operator will make. To fully prosper from IMS, it requires that all operators accept the implementation of IMS core networks. This is very unlikely to happen, even in the long run. However, it is very likely for the individual operator to implement different parts of the IMS concept, especially since this is already on its way. Of course, there will always be those operators who will invest more in IMS, and those who invest less or not at all. In order for other companies to know how this is turning out, they have to constantly undertake market follow-ups.

6.3.2 Tactel's Position and Future Options

The market dynamics and technology breakthroughs set high requirements on a smaller company and its strategy. In addition, if the organisation is growing fast, it is even more important to have an effective internal organisation with clear, pronounced strategies and business methodologies. For a company providing consulting services like Tactel, the competence and company culture are the main competitive advantages. Competences are often difficult to define and quantify. Business methods are a way of turning competence into concrete products, thus facilitating negotiations and offerings. According to Tactel's CEO, references are as also an important factor for determining Tactel's strategic position in the network. Tactel's image is based on a combination of its business method and references. In Tactel's case, being a business-to-business company, references are more important than image, since references have a deeper impact for smaller companies with limited marketing funds.

Tactel's business model is another factor that could impact on the network position and long term strategy. Their current business model for Solutions is based on charging a fixed price with the possibility for their customers to buy additional integration and consulting services. In an industry characterised by a long process before closing a deal, standardised products at fixed prices with possibilities for customisation along with foreseeable methods, will simplify the purchase and decision process for Tactel's customers. Especially since the offered services are

easier to quantify and motivate, and moreover decreases both the transaction cost and risk. For Tactel's part, it will be easier with the initial work for different offers, since documentation and specifications can be reused. A more transparent process will benefit both sides, reinforcing the relationship and thus the positions.

Transparency and standardisation are especially important for fast growing companies. This is central for Tactel since they could grow even faster if they would accept all the assignments offered. However, the focus is to extend the customer base, not profit maximisation, hopefully leading to more business and enhanced reputation in the future in the industry. At the same time, Tactel wants to keep and expand existing relationships, e.g. to spread their business risk. By doing so, Tactel will be better positioned in the network and enhance the possibilities for retaining and finding new structural holes.

However, to become successful in the Telecom industry, Tactel is dependent on its reputation, which is built on the competences and skills of the company's personnel. Tactel's position, with both operators and handset vendors as customers, is an important asset and can be regarded as a structural hole, see Figure 15 structural hole II. Structural holes seem to become even more valuable in the future for a smaller company in the increasingly competitive network where market conditions shift fast and the uncertainty is high. The information flowing over a structural hole enables an advantage in terms of more time and information overtakes, thus diminishing uncertainty. To take full advantage of the structural hole it is important to be flexible. This sets high challenges on the managers when building the company and its processes as well as on sales personnel handling the company's relations to act on important information and business opportunities.

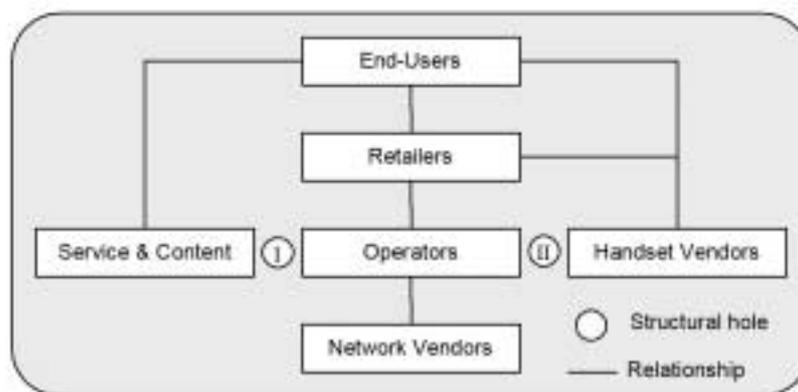


Figure 15. Schematic picture of the relationships and structural holes between certain Telecom industry actors³⁴⁵

³⁴⁵ Authors' own model

There will probably emerge another structural hole as some operators will only be concerned with network management. This enables content and service providers to retain a stronger position when they are no longer dependent on operators' restrictions. If the relationship between service/content and operators disappears, a structural hole will emerge as information will no longer flow between these two actors, see Figure 15 structural hole I. For Tactel this means a new business opportunity in a market with a prosperous forecast, especially for services providers.

However, for Tactel to secure and profit from its future position, they have to adapt themselves to IMS and the possibilities it might bring. Even though it is not Tactel's strategy to be an early adopter, they should still acquire some in-house knowledge regarding the technology. The best recommendation for a smaller company, such as Tactel, is to build up a small group of experts concerning IMS. This way, they can always be a part of the IMS game, competing by developing products (applications) and services (consultancy) for the architecture. Also, by only tying up a smaller amount of resources, they will stay flexible for the future.

In other words, IMS competence will definitely be requested within the next five years, and could very well become a competitive advantage. In order to have as much competence as possible in this area, without tying up unnecessary resources, is for Tactel to form a relationship with one or several actor who already posses this type of knowledge. These relationships are preferred to be with smaller and specialist niche actors that will depend on Tactel's competences to ensure equal trust and commitment for both sides. Another option is to acquire IMS competence from bigger actors or partners; however this can be associated with greater risk as Tactel can become too dependent on them. It is easier for a bigger company to set demands on smaller actors. Either way, the newfound relationship will increase the overall flexibility for Tactel. After all, the impact on Tactel does not have to be that profound, but could very well be also their way to secure a strong strategic position in the Telecom industry.

Tactel has to find a position in the network that enables them to keep a relationship with big and important customers in the future, with high business potential. Smaller companies with a long term growth strategy like Tactel, have to focus their resources where the profit potential is high in the longer term. It requires them to maintain and develop relationships, meaning they have to focus there limited resources on selected relationships. The relative importance of each relationship is higher for smaller companies.

6.4 Theoretical Analysis

For smaller companies with limited influence in a dynamic environment where the rules are determined by a handful of big actors, the general management theories and models are not always applicable. In order to understand a companies choices regarding its strategic position, where relationships plays a key role, such as in the

Telecom industry, a cross-fertilisation of the two theories industrial network and structural hole can be valuable.

Both theories starting point are networks with clusters or sub-systems of actors. The industrial network theory emphasises on interdependency and co-evolution between all the actors in a network, where any action taken in one relationship will automatically affect the other relationships. In direct contrast, the structural hole theory signifies the existents of actors in a network with very little or no influence on each other what so ever. However, the theory points out that these actors could be very well aware of each others existence, but simply have no time or reason to interact.

An example of an industrial network is illustrated in Figure 16, where all the actors are somehow connected to each other. In this example, it is clear that all the information shared in this network passes through four particular actors (the four darker circles), putting them in a situation where they can control the entire information flow.

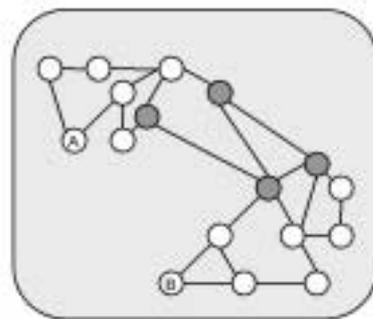


Figure 16. *A relationship network with controlled information flow*³⁴⁶

Now, let us take a look at the relationships between the actors in the network. According to the industrial network theory, there should exist some kind of influence between all of them. However, in this case, the influence between actors A and B can be questioned. It could very well be that the actors who are controlling the information (the four darker circles), chooses to leave out parts of it, in order to prevent any connection between A and B. Another alternative is that the existing path between A and B is so long that the influencing factor is lost on the way. Of course, this would only be true if there would exist some kind of barrier between A and B, making it impossible for themselves to connect to each other. Example of barriers could be a lack of time and resources, or even legal issues.

³⁴⁶ Authors' own model

What would happen if an actor such as X would mediate between A and B, as shown in Figure 17?

First of all, the path between the two actors would become a lot shorter. Secondly, and most important, the information would be able to flow through actor X and not through the original actors (the four darker circles), letting the network benefit from a richer information flow. This phenomenon is exactly what characterises a structural hole.

In other words, by combining the industrial network theory with structural holes theory, one might come closer to the truth, at least in the Telecom industry.

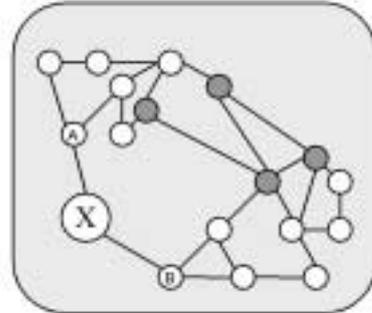


Figure 17. *A relationship network with richer information flow*³⁴⁷

³⁴⁷ Authors' own model

7 Conclusions/Recommendations



This last chapter presents the conclusion derived from the analysis and follows the same structure as the previous chapters; the Telecom industry, IMS and Skype, and finally Tactel, which includes three recommendations.

7.1 The Telecom Industry of Tomorrow

The Telecom industry stands before a paradigm shift where the dominating actors in the industry are fighting for retaining their position as they are threatened by diminishing profits from voice as well as new actors changing the industry landscape. At the same time, the industry is facing new technologies that further influence the evolution. The Telecom industry is becoming more sophisticated and converging with Internet technologies, which results in end-users starting to demand the same freedom and services found on the Internet. In addition, the operators' behaviour is very difficult to predict, for instance Tele2 launched their own VoIP application while Hutchison 3 chooses to cooperate with Skype. To summarise, the market and especially the operators are very difficult to forecast. It is therefore uncertain what really will happen with IMS in the future. However, new groups of actors will enter the Telecom industry, and these are the already established content and service providers from the Internet industry.

However, one thing is for certain, and that is the high cost associated with mobile networks that will require some sort of return on investment for operators. The operators can choose the business model adopted by broadband operators, allowing unlimited data (including voice) to the end-users. Another is to keep their control over their networks, which will mean that content and service providers will have to connect to the operator network in order to provide their product to end-users. In the latter case, IMS will be of much more importance. Triple-player operators, such as Telia and Telenor, will speed up the IMS roll-out in order to prolong their market power. After 2-3 years, the industry will be at a crossroads, where IMS will be the dominant standard or simply one technology amongst others.

Today, it is the operators who are found at this crossroad, having to either choose becoming bit-pipe providers and focusing on their core competences, or keeping their position and the control of the network. Most operators however will become bit-pipe providers, like today's broadband suppliers, and offer access to a converged network within the coming five years. The future will, in the short term, consist of fixed and mobile networks. In the long term, all networks will be IP-based. Service and content will become available on all platforms and devices, and increasingly dependent on branding as the market starts to mature around 2010. But there will probably be actors that will choose alternative strategies, and this is a serious threat for the actors who are deploying IMS.

In general, clear strategies and flexibility are important for a successful positioning within the network, especially with all the new actors entering the Telecom industry, bringing more complexity into the network. However, new customers enhance further growth, as customers are an important way for identifying needs, resulting in new products, services and relationship opportunities.

It might become more and more difficult for the companies further back in the value chain to satisfy their customers, since these are looking for relationships that can offer them everything needed. This means that finding good relationships will become more difficult and keeping them will be harder and more complex, especially for smaller companies. Strong and diverse relationships will play a greater part in the future for these companies. It is therefore vital to have a counterpart who is trustworthy. Sometimes, the trust between smaller companies and bigger actors is not that reliable. The relationship with the bigger customer might be of great strategic importance for the smaller company while the larger company has many relationships, and thus the relative importance for them regarding one specific relationship is much smaller.

7.2 The Impact of IMS & Skype

The IMS roll-out has already begun; the first IMS applications have hit the US market, and the IMS core networks are expected to reach the market within 3-5 years. However, it is important that all operators implement IMS core networks, for it to become successful. If this does not happen, it is uncertain whether IMS will be the dominant technology on the market or not. Either way, the future technology will be IP-based, which makes IMS an important technology to better understand the networks of tomorrow. So for Tactel, this means that having competence regarding IMS is important for future competitive advantage.

IMS is primarily driven by network vendors and operators. According to these actors, the most important reasons for implementing IMS are QoS, end-user usability, converged networks, standardised applications, and the transition towards the all-IP vision. The biggest benefit for operators is their prolonged network control, which allows billing and sustained power position in the industry.

However, the Telecom industry will not be able to turn IMS into the single, global standard needed to fully deploy the advantages of IMS. There will be other forces (competing technologies and business models) on the market preventing operators and network vendors from pushing out yet another technology. The authors believe that IMS will become one of the leading technologies within the next 5 years. IMS is a new core network architecture, which some operators will fully deploy, especially those offering converged networks but also those offering differentiated services. Some operators will only implement single IMS applications.

Regardless of the network structure, operators are needed, even though their position and market power may vary. Within 5 years operators will probably still have a strong market position, at least for corporate customers, while consumers will increasingly be using Skype. It is about what customers want and to what price. Some operators will outsource content and services to third parties, focusing only on network management. Initially it will only be possible for end-users to access certified content and services through the IMS controlled network, but eventually the data traffic will be free and operators will only focus on network management and support. To become competitive they will have to focus on lowering cost, thus the consolidation will continue. The trend for fixed operators to invest in IMS for reducing cost could be regarded as a factor that will also be the case for mobile operators, as well as triple-players.

Nonetheless, IMS will still have a profound impact on the market, perhaps more than expected, as it is supported by all operators and network vendors, but it will probably impact the market much later than forecasted. IMS does not affect smaller actors' market position in the value system. IMS standardises multimedia, thus content gets more important, and furthermore IMS enables the emergence of content tools, which makes it easier to supply content. Today, service and content providers have to come to the operators in order to get connected to the network and access the customer base. For IMS to succeed, it is important to identify compelling and differentiated new services, and to overcome today's commercial challenges.

How the market power will be divided between operators, handset vendors, and content and service providers, is yet to be shown. The latter ones will most certainly become important actors in the Telecom industry. Therefore, one possible strategy for Tactel could be to find at least one big customer in this area, and develop a third business area for service providers. In the future, pure consulting assignments might be the way forward for Tactel, and its mobile application competence could become very valuable for actors from the Internet industry entering the Telecom industry.

In addition to the IMS impact on the market, the penetration of Skype will continue to grow. This is all due to the fact that VoIP experiences a constant linear growth, where all voice eventually will go through the PS-domain, and not through the CS-domain, which it does today. The impact of Skype will especially be noticeable now, when new protocols are launched, giving priority to voice over data. The biggest threat for today's operators are if the different companies offering VoIP services, such as Skype, would open up their services between each other, making it possible for a Skype user for instance, to call a different VoIP provider. This would increase the VoIP providers total customer base, increasing their overall competitive advantage over regular operators. However, one of Skype's strengths, i.e. their encrypted traffic, would in this case be a problem when trying to open up to others.

7.3 Three Recommendations for Tactel

1. First of all, Tactel should keep their current “profile” (business models and strategies), focusing on building partnerships with equal actors and opt for bigger customers. It is important to continue developing the internal processes, which supports their strategy, especially since they have a strong growth. This is important as Tactel’s reputation and future strategic position, is based on its personnel’s and management’s competences.
2. Secondly, Tactel ought to wait before fully invest in IMS. To begin with, they should invest in finite in-house expertise. To secure a possible breakthrough of IMS, they should try and find smaller companies who already possess the general knowledge of IMS, and build strong relationships with them. This way, if IMS gets closer the take-off point, they can rapidly become a company to be counted for in the IMS segment. Furthermore, this enables them not having to tie up resources before a possible breakthrough, and instead keep investing in their current core competences. This is very much alike what happened with DM/DS at Tactel, who started out with just one or two people and are now close to forty people. In other words is this truly the “Tactel way” of doing things.

However, it is not easy for smaller companies to establish good relationships in the Telecom industry. It requires both time and effort. Therefore, it is important for Tactel to find an actor about the same size, which supplies complementary products and is equally dependent on Tactel. They should also try to find a niche within IMS that follows their current business plans and competences, i.e. focus on either consultancy of specific IMS issues or developing IMS friendly applications. In order to do this, Tactel can continue investing in specialist competences such as mobile TV and sync-management.

In conclusion, it could be said that the “Tactel way”, starting out in small scale not investing in too much resources, letting the competence and resources grow alongside a new technology, is recommendable for all smaller companies. This is especially true in cases when the market does not know what they want in the beginning, and the company in question does not have the resources or strategy of being a first mover. After all, there is a lot more potential of learning at the take-off point, than in the beginning of a new technology life-cycle.

3. Finally, there are several interesting areas (a-d) for Tactel to find a niche in.
 - a. First of all, an interesting thing worth noticing is the fact that there is no existent of any structural hole between the operators and end-users, but rather between service providers and the end-users. IMS will be a very important tool for the operator’s to maintain control over the

network. If they succeed, they will be able to influence content and service providers and handset vendors. This could eventually lead to them maintaining their current position and exploiting the structural hole between the service providers and end-users. If this does not occur, it is a golden opportunity for companies, such as Tactel, to fill this structural hole by helping the service providers to adapt their services to the market.

- b. Another interesting area for Tactel is to bring e.g. Skype to traditional mobile phones and platforms, becoming specialists in the transition of Internet actors to the Telecom industry. It is important to be conscious of the affect on Tactel's current relationships, especially with the operators. Tactel needs a clear strategy when positioning itself as this has implications on its reputation and image, which will become increasingly important when the market matures. Smart phones are the clearest example of the intertwining of the Telecom and the Internet industry. It could be a strategy to expend today's position towards the smart phone industry and Windows Mobile applications, hence a position closer to the Internet industry. A consulting area for Tactel could be to link services between PCs and mobile phones.
- c. Furthermore, companies with strong brands will enter the Telecom industry, needing Telecom competence to deploy their products. Operators risk loosing their dominant position, and Tactel should therefore focus on a third customer group, namely content and service providers. These actors will become strong in the future, how strong is partly due to the operators' actions and their ability to deploy IMS. The market will probably be an important factor to consider as well, not mentioning other technological breakthroughs.
- d. Finally, there will always be a need for companies deploying applications and services, enabling the convergence between IMS networks and non-IMS networks, since these will both co-exist, no matter what will happen with IMS.

7.4 Further Study

The recommendations are based on smaller companies in the Telecom industry. It would be interesting to see if the same conclusions, regarding the importance of relationships for supporting a position, would occur in other industries characterised by a dynamic environment.

It would also be of interest, when studying less dynamic and complex industries, if the finding of structural holes exists and if they would present the same kind of opportunities for the actors in that industry as they do here.

In the future, when knowing what happened with IMS, a study can be done whether IMS was just another attempt to standardise the industry, or if it was in fact the verge to a new technology lifecycle (next generation network), for the Telecom industry. How do different business models, adopted by operators, affect IMS and the development of the industry?

When looking at the theoretical studies of this Master Thesis, it would be an exiting point to elaborate the bond between industrial networks and structural holes. Maybe conducting analysis in several different industries, would strengthen the theoretical analysis in this Master Thesis, and develop it to even further stages.

7.5 Reflections on the Research

Looking back at the theoretical framework presented in this Master Thesis, it is clear that this combination of theories worked, delivering credible answers to the problem discussion at hand. The framework *per se*, has an original touch, since the combination of the theories is rare, complementing each other as well as broadening the overall view, as described in chapter 3 and analysed at the end of chapter 6.

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Appendix I

1.1 IMS Layers

The Application Layer provides applications and services to the different sessions. *The Control Layer* allows the user's different devices to be registered with the IMS network. It also sets up the sessions between the users and allocates the requested services. *The Connectivity & Transport Layer* sets up and controls the sessions. *The Endpoint Layer* constitutes the different devices that can be used for a session³⁴⁸.

1.2 IMS Elements

IMS consists of several elements, where the main element is the Call Session Control Function (CSCF), which is a SIP proxy and registrar server. There are three different types of CSCFs: proxy, interrogating and serving, see Figure 18.³⁴⁹

Proxy CSCF (P-CSCF) is a SIP proxy server and is the entry point into the IMS network, for IMS User Equipment (UE, found in the Endpoint Layer). *Interrogating CSCF (I-CSCF)* is a SIP proxy server that finds the appropriate S-CSCF, by contacting the Home Subscriber Server (HSS). *Serving CSCF (S-CSCF)* is a SIP registrar server that handles all the signalling between the endpoints. It also enables the access to the network services, provided by the network operator, for the requesting user.

In addition to the main elements, there are five other important elements within IMS. *Home Subscriber Server (HSS)* is a central database that stores information about currently assigned S-CSCF as well as enables operators to better handle subscriber data. It stores data such as user identity, registration information (IP address), buddy list/instant messaging information, voicemail options etc. *Breakout Gateway Control Function (BGCF)* is a SIP server that selects the network in which PSTN/CS Domain breakouts is to occur. *Media Gateway Control Function (MGCF)* performs protocol conversion, enabling communication between IMS and CS users. *Media Resource Function Controller (MRFC)* supports bearer-related services, such as personal user announcements and conferencing. *Media Resource Function Processor (MRFP)* provides media stream processing resources for announcements as well as media mixing, analysing and transcoding. *Media Gateway (MGW)* enables linkage between CS networks and the IMS.³⁵⁰

³⁴⁸ IntelliNet Technologies (2005) p 20

³⁴⁹ Bea Systems (2005) pp 9

³⁵⁰ Poikselkä, M., et al. (2004) pp 23

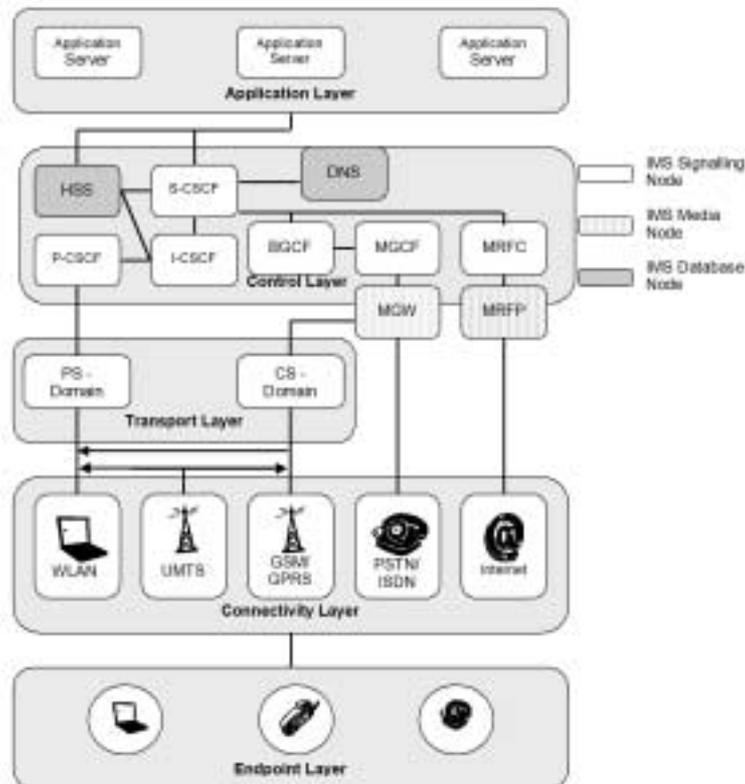


Figure 18. IMS Infrastructure³⁵¹

1.3 Call Session

Louise wants to call Hanna in Beijing. Their telephone numbers (SIP URIs) reflects the geographical location of their operators. Louise who lives in Chicago, USA, has louise@chi.com, while Hanna who lives in Beijing, China, has hanna@bjg.com. Let's assume that they both have SIP phones, with 3G UMTS IMS operators.³⁵²

Step 1 – Creating a data connection to the IMS domain. This step involves the registration procedure for Louise, and starts off with sending her IMSI to the PS-Domain for authentication. When this is completed, Louise's profile is downloaded and a location updated. After the link between the phone and the PS-Domain is established, the phone's location is then known in the UMTS network. Louise's phone sends a known activation message to the PS-Domain, which returns the IP address of the P-CSCF that will be used (p.chi.com).³⁵³

³⁵¹ Authors' own model

³⁵² SIPKnowledge (2004)

³⁵³ *ibid.*

Step 2 – Establishing a home network contact point. The next step in the session is that a SIP registration is sent from Louise’s phone to the P-CSCF, including her identity, IP address, and the name of her home network domain (chi.com). The registration is then forwarded to the I-CSCF, which sends a query to the HSS. The HSS checks if Louise is allowed to register in that P-CSCF network according to her subscription. (If it had not been her home network, roaming agreements would have been looked at.) A response is sent back from the HSS to the I-CSCF, stating that Louise is allowed to register, and sends the name of the S-CSCF that will be used (s.chi.com). The home network contact point is now determined by the I-CSCF. (It could either be the S-CSCF in this case or if network configuration hiding is desired, it would be the I-CSCF). The I-CSCF sends the registration to the S-CSCF, which includes the P-CSCF’s IP address, home network contact point, and the subscriber’s identity. Now the S-CSCF sends a message first, containing the subscriber’s identity, to the HSS that enables a download of the relevant information of Louise, then it sends an OK message to her phone.³⁵⁴

Step 3 – Inviting a user to a multimedia session. Louise gets now an indication that she can initiate a multimedia session (in this case an IMS VoIP call). She enters Hanna’s SIP URI and presses the send button. The phone sends a SIP invite to the S-CSCF, via the F-CSCF, and further on to the DNS server, which performs a lookup and returns the IP address of the I-CSCF in Beijing. (The I-CSCF is the entry point to the IMS network in Beijing). After the lookup, the S-CSCF sends an invite to the I-CSCF. The I-CSCF in Beijing gets the address of the S-CSCF that was used for Hanna’s registration procedeur, from the HSS. The S-CSCF forwards the invite to Hanna’s phone that determines what type of media flow proposed by Louise’s phone, and sends a response back to Louise. During this time, both Hanna’s and Louise’s P-CSCF authorizes the necessary resources for this session. Louise’s phone decides the offered type of media streams and can offer new media during the entire session (although, this will require new authorization from both sides). After the media is decided upon, Hanna’s phone will alert her by ringing and at the same time sending a ring message to Louise’s phone. Both the P-CSCF instructs their “media gates” to open, in order for the session to begin.³⁵⁵

Step 4 – Talking. At this point they can finally talk to each other.³⁵⁶

Step 5 – Terminating a multimedia session. When Louise hangs up, her phone sends a BYE request, which Hanna’s phone responds to. At this stage, billing is finalised. The P-CSCF’s, HSS’s and the S-CSCF’s “configurations” will still be allocated for their next call.³⁵⁷

³⁵⁴ SIPKnowledge (2004)

³⁵⁵ *ibid.*

³⁵⁶ *ibid.*

³⁵⁷ *ibid.*

Appendix II

2.1 Skype Call Session

Hanna wants to call Louise back from Beijing. If it is the first time Hanna calls Louise, i.e. Louise does not exist on her buddy list; step one and two has to be run through. If they already have talked to each other over Skype, only step two has to be run through in order to place a call.

Step 1 – As Hanna logs on to the Skype client, it verifies her authentication with the login server. It finds the closest super node and establishes a connection to it. Now, Hanna has to find Louise and does so by searching after her name or user name in her Skype client. It requires that Louise is online and accepts to join Hanna's buddy list, in order for Hanna to get Louise on her buddy list.³⁵⁸

Step 2 – As Hanna presses the call button, a connection is established with the super node, which finds Louise and sends her location back to the client. A synchronisation request is then sent to Louise's Skype client and she accepts by pushing the "answer" button. The connection is now set and the call session can begin.³⁵⁹

³⁵⁸ Baset, S. A. et al. (2004) p 7

³⁵⁹ *ibid.*