

Mobile-service Development within the Mobile Arena Cluster

Case Study of Mobile-service Design Process

Master thesis, 10 credits, INF 800, in Informatics

Presented: 06, 2006

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Master thesis presented 06, 2006
Size: 80
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Abstract

The purpose of this case study was to explore the socio-technical contexts of mobile service development within a network, the Mobile Arena Cluster functioning in Malmö, in the South of Sweden. The main research question was: how do the members of the Mobile Arena Cluster develop Mobile services. In order to answer the question, it was necessary to research first the cluster and its contexts. The research of the Mobile Arena Cluster with its networks was conducted with an e-survey and interviews, and the findings were examined through Cluster Theory of Porter (1998). Because one of the goals of the study was to provide the Mobile Arena Cluster with new ideas for a more competitive cluster, the results were reflected to the cluster literature and statements of a cluster specialist. The second phase of the study found out, how the Mobile Arena Cluster members act in the design processes when developing the mobile services. The cluster members were interviewed in their actual working environment and the findings were analysed through Activity Theory (AT). Because another goal of the study was to identify, how the Mobile Arena cluster could improve their mobile service development processes, the findings were reflected to the HCI design literature that advises in developing user-centered, interactive product or service concepts. According to the findings concerning clustering, the Mobile Arena cluster could develop their network by organising more co-operational activities in order to attract new members and fostering innovations. Organizing its activities and acquiring new kinds of competences - such as a cluster leader - would benefit the cluster. The findings of the service development process gave a slight indication that also specialised competences like that of an Interaction Designer could be useful in the mobile service design contexts. The iterations and user-centered approach, recommended by HCI literature, was natural part of the development process of the cluster, even if a more versatile and systematic use of HCI design methods would benefit the Mobile Arena Cluster.

Key words

Mobile Cluster, Mobile-service Development, Human-Computer Interaction (HCI), SOA, Activity Theory (AT)

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1 Introduction

This case study explores a cluster called Mobile Arena. The cluster is functioning in the South of Sweden, located in the Öresund-area and characterized by the closeness of Denmark. Mobile Arena consists of companies that work together with developing the mobile services. The Mobile Arena aims to provide their customers with integrating advantages of mobility. The target customers are mainly from the field of healthcare. Even if the Mobile Arena cluster competes successfully in this niche market, the competition is challenging and the competitive edge must be constantly sharpened. Clusters are networks of actors that cooperate in order to achieve competitive advantage on the markets (Porter, 1998). The reader of this study will find out how the Mobile Arena cluster members cooperate in their socio-technical contexts. In addition to this, the study explores how their services are developed. The investigation concentrates on the mobile services, mobile service development process with its methodology, social settings of various actors and networking that serve the economical aspects of Mobile Arena cluster. Introduction chapter brings forward: the motivation for selecting the subject, the purpose and the objectives of the investigation, the focus of the study and target group of this report.

1.1. The motivation of the subject

The networking and clusters are considered to be important, when trying to create competitive advantage; reduced costs and better position in the market (Porter, 1998). According to Löwgren and Stolterman in order to understand development of technology, it is vital to consider the goals of the development. One of the common goals is economical; increased earnings and reduced costs. (Löwgren, Stolterman, 2005.) These factors are driving forces behind clustering and developing mobile services. Mobile service supply side is highly dependent on user acceptance and use, both in leisure and business contexts (Scottish Enterprise, 2006). The business customers are the first to adopt the new mobile applications – for companies, mobile services can provide remarkable savings in time and money (Leppävuori). The challenges for mobile services are mostly non-technical like understanding the needs of the customer and user, and ensuring that a solution meets their requirements (Alahuhta et al, 2005).

The mobile service development process includes many actors with their interests and goals. An interesting research problem in mobile commerce is new applications and services made possible due to the wireless networks and mobile devices (Varshney and Vetter, 2002). Mobile services are constructed of a portable or wearable device that is in use of a human being. Mobile services are best suited when there is a need of real time information without requirements for large displays or input capabilities, though exceptions can include for example need for bigger screens for monitoring within health care (Alahuhta et al, 2005). According to Varshney and Vetter, the user needs and trust will play a crucial role in widespread deployment of mobile commerce applications. For designing the purposeful and helpful devices and services, the cooperation between users and designers is necessary. In addition to this, the mobile service development requires active participation of computer and telecommunications experts, social scientists, economists, and business strategists (Varshney and Vetter, 2002). The multidisciplinary groups of competences in

cooperative activity can gain excellent results. One multidisciplinary and creative example of clustering is the Silicon Valley in United States (Porter, 1998).

1.2. The purpose and objectives of the investigation

The *purpose* of this case study is to discover the socio-technical contexts of mobile service (m-service) development of the Mobile Arena -cluster in Malmö, Sweden. The approach is based on human-computer interaction (HCI) design process point of view, which is generally defined being user-centred, iterative and multidisciplinary. In order to meet the purpose of the study the main research question asked is; *how are mobile services developed in the socio-technical contexts of the Mobile Arena cluster?* The research question requires researching the contexts of the cluster and the contexts of the mobile service development processes.

As to be true to the purpose and answer the research question, the investigators chose to divide the study into the following main parts (Figure 1.1);

1. Investigating the cluster with its networks and interest groups with a survey and interviews. The findings of Mobile Arena cluster are examined through the Cluster Theory of Porter (1998). The findings are compared to a cluster literature and specialist statements that inform, how to develop further the Mobile Arena cluster.
2. Investigating m-service development process of Mobile Arena cluster by interviewing and observing the Malmö Mobile Arena cluster members in their actual working environment. The observation and interviews of cluster members acting in the design process are analysed through Activity Theory (AT). The findings are compared to Activity Theory literature and HCI literature that advises in performing user-centred development of interactive product or service concepts.

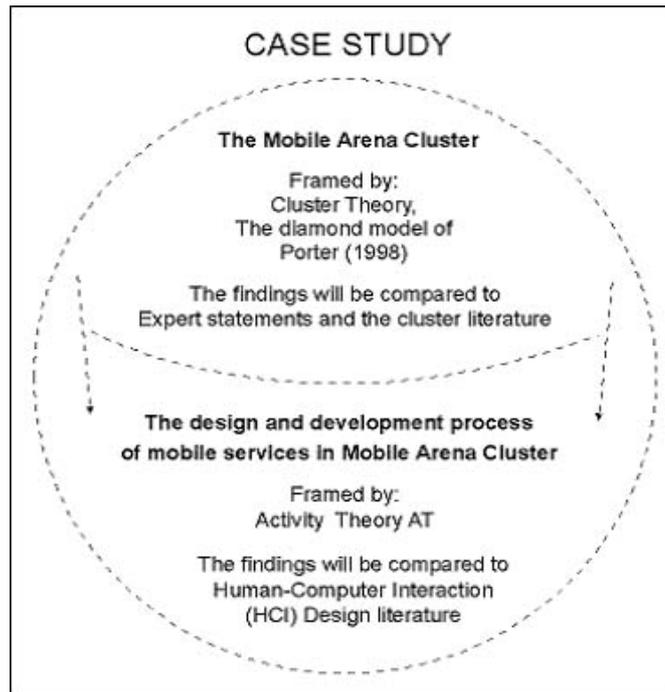


Figure 1.1. The structure of the case study, Mobile Arena Cluster.

With this study, the investigators hope to accomplish the following three main goals:

- Investigate empirically from a human-computer interaction (HCI) design point of view, with focus on Interaction Design, how different interest groups interact around mobile service development within the Mobile Arena cluster.
- Study how mobile services are developed in general and within the Mobile Arena cluster. The relevant cluster and service or product development process literature and specialist statements will be used.
- Identify possibilities for more advantageous Mobile Arena cluster and service development processes for the Mobile Arena cluster.

1.3. The delimitations and focus of the study

The study includes competitive advantages, networks, socio-technical activities, and finally professionals and users in the design process. It cuts a vertical slice of activities around service development in a cluster. It is necessary to explore the markets around the cluster, but in this study that is not done in detail – the focus is on the Mobile Arena cluster companies - from now on referred to as members. The study is conducted in co-operation with members within the cluster Mobile Arena, and is delimited around this specific case in a specific location. The findings can not be generalized beyond the case. Due to focusing on the Mobile Arena cluster, the study ex-

plores developing process of mobile business-to-business solutions within the wellness and health-care sector. Investigating the design process of Mobile Arena takes place during a specific time period and due to this fact the complete design process can not be investigated. The methods that Mobile Arena members use during observing the development process are compared to some of the methods in HCI literature. Advising how to apply the presented design methods is not part of this study. Investigating the cluster is framed by one theory, and investigating the development process is framed by another theory. The theories are not presented in detail, but the contents are emphasised by the most appropriate factors concerning this specific case. The case study protocol defined some of the words used in this case study. For example the word “*findings*” is used instead of the word “results”, and word “*investigators*” refers to the authors - instead of the expressions like “we” or “researchers”.

1.4 The target group and presentation of the content

This case study report aims to be useful for the participating companies of Mobile Arena Cluster, other actors around clustering, the students and lecturers on the multidisciplinary field around HCI. After introduction the reader is presented with the methods that were used for exploring the subject. The chapter 2, Methods, is followed by chapter 3 including a presentation of a cluster and the mobile service development contexts. Chapter 4 presents the Cluster Theory, Activity Theory and Human Computer Interaction literature. The findings, analysis and discussion about socio-technical environment of the Mobile Arena cluster and their service development process can be read in chapter 5. In the chapter 6 the investigators draw the conclusions of the findings of the case study Mobile Arena cluster. The journey through the case starts with the story about how the Mobile Arena cluster was investigated.

2 Methods

The methods chapter aim to give a profound picture of how the investigation of Mobile Arena Cluster and their design and development process was conducted. It includes the presentation and description of the motivation, methods used for studying and analyzing the cluster Mobile Arena, as well as the development process of mobile services within the cluster. Further on the investigators argue for the choices made during the investigation and give an evaluation about the quality of the case study.

2.1 Selection of the approach

From the beginning of the investigation process the investigators knew that they wanted to study one or more companies that develop mobile services. What they didn't know was what would be the company and the subject. After exploring the telecommunications market as well as articles about mobile services the investigators became aware of clusters and groups of interconnected companies that develop mobile services. Since the investigators personal interest and field of expertise is Interaction Design, the mobile service or product development process within a cluster was a conscious choice. Thanks to valuable contacts, a cluster called Mobile Arena was discovered and the cluster members agreed to cooperate with the investigators. The subject of the study was found and it was not necessary to go through the identification process of a mobile cluster, although some preliminary investigation about cluster maps of Sweden and about identifying clusters was done.

The subject cluster, Mobile Arena, is a group of small companies that develop mobile and fixed digital services, with various individual members that collaborate together in different projects. The first contact with the Mobile Arena cluster was with one of the members; Penbook Sweden AB that was the main contact during the investigation process. The contact person from Penbook Sweden AB helped with formulating the approach for the study: the cluster, mobile services and the development process. The next phase was to find out, how the cluster, mobile services and the development process were to be explored.

The purpose of the study was to explore the socio-technical climates that surround mobile-service development and design within a cluster that develops mobile services. The purpose and objectives of the study is introduced in the first chapter. In order to reach the objectives, the study explored how the mobile services are developed in the socio-technical contexts of the Mobile Arena cluster. The research plan was written. Later on a separate schedule and a research protocol (Appendix 1) were created in order to be able to communicate easier the research purpose and goals. Several sub-questions concerning the cluster and design process rose from the purpose. The investigators decided to explore for example, what defines a successful cluster. They wanted to look into socio-technical contexts; how do the actors within the Mobile Arena clusters interact - and in what way the Mobile Arena clusters encourage designing successful mobile services. Finding out these issues required investigating: what are the methods used in m-service development process, who participates in m-service development process, what kind of expertise they present and at

what phase of the mobile service development process are they participating. Concerning the service development process the study was curious about, how iterative the design process is, and what would be a feasible mobile service design process within a cluster. As soon as the investigators learned more about the subject during the research process, the protocol and research questions were developed.

The case study was a natural choice after doing a literal research of the theories. Many articles revealed that Cluster Theory, Activity Theory and Actor Network Theory were used in case studies. These theories appeared to fit the Mobile Arena study and so did case study. Case study is chosen, if the researcher deliberately wants to cover contextual conditions around the case (Yin, 1989), like the case Mobile Arena intended. In order to study the cluster Mobile Arena in detail, be true to the purpose of the study and answer the research question the most appropriate tradition of inquiry was a single case study. The case was bounded in time and place and rich context. In order to gain an in depth picture of the case extensive amount of material from multiple sources must be gathered (Creswell, 1997). The multiple sources were found to be necessary in order to investigate the versatile contexts around Mobile Arena. According to Yin a case study is an empirical inquiry that investigates contemporary phenomena within its real-life context especially when the boundaries between phenomenon and context are not clearly evident. Case study is chosen, if the researcher deliberately wants to cover contextual conditions around the case. (Yin, 1989.) The boundaries between the Mobile Arena cluster and the context were not at all evident. The investigators chose to focus on studying the present situation of the socio-technical context of the mobile service development, and to explore and analyse possibilities for more successful Mobile Arena cluster and more advantageous ways of developing mobile services in the future.

2.2 Data gathering

The structure of the study was divided into two theoretical parts. Investigation of the Mobile Arena cluster was studied based on the Cluster Theory of Porter. The design and development process needed another theory. After vast exploration of the Activity Theory and Actor Network Theory literature, the investigators chose to utilize Activity Theory for framing the study. The Cluster Theory and the Activity Theory framed the subjects that the research questions handled. The theory selection is motivated in the chapter four, which gives a short presentation of Cluster Theory and cluster initiatives, Activity Theory and Actor Network Theory. What is interesting about the theories at this phase is the fact that the methods with their contents were chosen keeping in mind the theories. In order to gain appropriate data for analysing wide and deep contexts of the Mobile Arena cluster and its mobile service development process, it was considered necessary to utilize these different types of theories and methods. To explore the cluster Mobile Arena the investigators used quantitative approach with an Internet survey and e-mail interviews, but also personal meetings and interviews added to the data. In order to study the mobile service development process the approach was mostly qualitative and based on the observations. The investigators tried to find the best combination of different methods in order to get high quality data for the analysis.

The investigators aimed to gather and present only relevant data concerning the case. A great amount of data material originated from Mobile Arena. This material directed the research actions of the investigators and had an effect on the searching explanations or challenging the mate-

rial from other sources. The investigators gathered extensive amount of material about the cluster in order to be able to describe and analyse the cluster and its development process in depth without risking misinterpreting various phenomena and their contexts. It was also necessary to have a lot of material in order to compare the different sources and the seriousness of material received. Researching the mobile service development process of the Mobile Arena Cluster in depth is a wide area and the investigators acknowledged that it required several separate data collection phases.

2.2.1 Secondary data

The investigators secondary data was collected from books, reports, articles, white papers, documents and involves mainly literature about the Cluster Theory, Service-oriented architectures (SOA), the Action Theory (AT), Actor-Network Theory (ANT) and Human-Computer Interaction (HCI) with the focus on Interaction Design. Primarily the articles were searched via the databases using key words like; mobile services, Actor Theory, Actor-Network Theory and Service-Oriented Architectures. Much material for example a power point presentation, about Mobile Arena has been provided to us by the Mobile Arena member, Penbook Sweden AB. A great deal of material was acquired from publications of Vinnova, Sweden and Tekes, Finland. When this study was made Tekes was running a national project concerning mobile services.

2.2.2 Primary data

The primary data was collected in three separate parts and several different ways; observations and interviews in a natural environment, e-mail interview of a cluster expert and an online survey and interviews answered by the members within Mobile Arena cluster. The findings are described in the chapter 5 – the investigators present here how the primary data was collected.

The target of observation was mobile service development process of the Mobile Arena cluster members that were operating in the premises of their client. Together with one member from Mobile Arena, the company Samarbetsteknik, the investigators observed their interaction with the clients from a hospital in Hässleholm, Sweden. The observations occurred during one day and included two separate demo projects that were part of a larger pilot project at the hospital in Hässleholm. The primary informants during the observations were the cluster members not the persons at the hospital, and that is the reason hospital personnel is not presented in detail in this case study. The observation data in the hospital was collected using notes and a digital camera with permission from the persons involved. The observation was done on basis of an interview guide in Swedish (Appendix 5) based on the Activity Theory triangle and HCI literature about design process that are described in chapter 4.

The e-mail interview was answered by a cluster expert and included 10 questions (Appendix 3) in English about mobile clusters within the local market. The emphasis was on the advantages and possibilities of the Mobile Arena Cluster and was based on exploring competitive advantages. The informant received a draft of the research report with a description of the Mobile Arena cluster and gave the answers on basis of the description. An e-mail interview was the fastest and the most economical way to receive the statements of the expert after data collection of Mobile Arena Cluster.

The prime part of this study was the survey. The survey was written in Swedish which was understood by all informants. The Internet survey was answered by members within Mobile Arena

and the survey included 38 questions with a mixture of open and closed questions about the members networking contexts (Appendix 4). The questions were based on the cluster diamond of Porter described in chapter 4. The informants that answered the survey all occupied high positions within their separate companies. At the time of the study the cluster included eleven members, and seven of them chose to answer (Answering rate=63%), and fortunately all three founders of the cluster Mobile Arena answered the survey. The construction of Mobile Arena is described in chapter 3.

2.3 Evaluation and analysis of the collected material

The possibility to participate the design process, observe and for some appropriate parts record observational material adds to the value of an in-depth case study (Yin, 1994). In order to add to the survey results and get proof of the real action the observations were conducted. A case study must consider alternative perspectives and collect all the relevant evidence to challenge the study (Yin, 1994). The data collection emphasised the views of the Mobile Arena members. Acquiring views from other collaborative parties would have required more extensive investigation resources that were not available.

In order to construct validity correct operational measures has to be established for the concepts that are being studied (Yin, 1994). The theories in the case study has been criticised and reflected towards other theories. The questions asked from the informants were based on the selected theories. Multiple sources of information and combination of different kinds of data collection methods were used. Like Yin (1994), Creswell (2005) emphasize the importance of testing the seriousness of data. In order to make the data collection more robust, the investigators searched for information that could guide and challenge their material and the information that was gathered was verified by seeking the same data from other sources. Information about the Mobile Arena cluster was confirmed by several members within Mobile Arena and the specialist interviews supported the gathered literature around clusters and vice versa.

2.4 Ethical issues

According to Miles and Huberman (1994) at the early stages of the study a project's worthiness, the researcher's competence, informed consent, anticipated benefits and costs are evaluated. Later phase raises topics like harm and risk to the informant and researcher, relationships with informants, privacy confidentiality, anonymity and intervention. And at the latest point research quality, data ownership and use of findings may raise ethical concerns (Miles and Huberman, 1994).

The basic ethical principles of this study were early stated in the research plan and in the protocol. Also the protocol - that was used all through the investigation - included the issues regarding the anticipated benefits and cost of the study, how the informants were to be treated, how they and their statements were to be handled, research quality, and the handling of the collected material. Although the interview techniques and ethnographic approach were familiar to the investigators, the competence of investigators was limited concerning other factors. There were no experience of the use of Cluster or Activity Theory, and the technical part of mobile services was not

familiar in detail. A vast amount of resources was used in order to collect information to compensate the lack of competence on these areas.

In all the data collection material, the contact information of the investigators was clearly presented and the informants were encouraged to contact the investigators through different mediums. Statements from the informants were promised to be left out of the study by request at any phase of the research. The material collected was stored with care and confidence and have not been given out to any third party or other investigations at any phase. These factors were informed to the informants. According to Miles and Huberman confidentiality agreement about data storing and access can increase trust for the researcher, who should have sensitivity for these factors and not break a promise of make informant feel cheated. (Miles and Huberman, 1994.) The Mobile Arena informants granted a permission to reveal their names since this study also function as a presentation of the Mobile Arena. Also a written permission from the cluster expert was asked and the right to refer to comments with his name was received.

Creswell notes the ethical issues that are important during data collection. The informant should be informed that an investigation occasion concerns a study and its purpose and nature should be revealed. (Creswell, 1997). The protocol was a helpful tool in this sense. All the informants have been informed about the purpose with the study and all the picture material from observations have been authorized by the persons on them. The hospital environment is especially sensitive what comes to data collection. Due to this fact no video recording was done. The investigators chose not to mention any of the names of the persons in the pictures, only their role, because names were not relevant according to the purpose of the case study that was designed to be public. The integrity of the patients and personnel was taken into consideration.

Finally reflection, use of third parties and regular checking and renegotiation are some of the guidelines for higher ethics in the study (Miles and Huberman, 1994). The research material was tested and evaluated by persons outside the investigating team. A pilot study was conducted and informants were informed sufficiently about the subject studied. Special attention was paid for making the research material and guides pleasant, readable, correct and understandable by the target informants.

The study is public by the nature. The publicity of the findings was decided with the member Penbook Sweden AB during a first discussion. The aim was not to keep the findings secret; on the contrary all possible publicity was recognized to be important. Access to the findings was naturally granted to all the participants of the study. Next the quality of the investigation is discussed further.

2.5 Discussion on validity and reliability

The investigators aimed at creating a holistic image of Mobile Arena and their development process of mobile services by collecting data from different sources and by paying attention for the usability of information. A good case study is complete and offers an understandable description of the phenomena and its context; it demonstrates that the relevant evidence is collected (Yin,

1994). The investigators argue that the relevancy of this study was evident since the mobile service development and the way in which these services were developed were at the time of great interest for the local actors like the Mobile Arena cluster, and national Nordic actors, like Tekes. A case study should be significant: unusual and interesting for a general public, and the researched issues are important (Yin, 1994). The study has been conducted in co-operation with members within the cluster Mobile Arena and the members of cluster had a great effect on the purpose and the goals of the study. The protocol defined potential benefits for the participating companies:

1. Make the cluster stronger in the market,
2. Identify possibilities for designing more successful services with more effective m-service design process and to,
3. Gain positive publicity at the University of Lund, Nordic press, potential clients and potential new networking companies.

One of the main goals of the study was to benefit the co-operating companies by identifying possibilities for more advantageous clusters and mobile service development processes.

Before conducting the observations the investigators tested the material in a pilot study (see appendix 5). Involved in this pilot study was a mobile service developer/researcher at TeliaSonera in Malmö, Sweden. The pilot study allowed the investigators to test the purpose, the research questions, the research guide and the planned interview practice. In addition to this a lot of background information was gained. The analysis of the pilot study revealed that the questions had to be more specific and with multiple choices and guided the investigators in re-formulating the research methods before conducting the actual case study.

External validity establishes the domain for generalized findings and tactics is using replication logic in multiple case studies (Yin, 1989). This case study explored only one cluster, namely the Mobile Arena cluster, and its development process of mobile services. The investigators were not aiming to generalize, but instead they described the selected cluster with no intentions that the findings could or should be translated onto other clusters and their development process. Instead by choosing a single cluster the investigators aimed to describe how a specific cluster functioned, and how in case of this cluster the development process occurred.

Internal validity means establishing causal relationship; certain conditions are shown to lead to other conditions; during data analysis phase pattern-matching, explanation-building and time-series analysis can be done (Yin, 1989). In order to structure the analysis, the investigators lined up the answers from the e-survey in a table and conducted pattern-matching in order to identify various patterns regarding the various factors within Porter's Diamond model.

Before the data collection the investigators created a case study protocol (Appendix 1). The different phases of the research were controlled in a case study protocol that was developed according to the development of the study. It included preliminary methods, the way to investigate, research questions and a plan for analysing and writing the report. The protocol was made in order to gain common understanding of the research and communicate this understanding forward during investigation. The protocol framed the study and helped in communicating its purpose and intentions of the investigators to each other and other parties. The Protocol also served as a research documentation platform for the two investigators. The protocol guides the researcher to carry out the study and provides a tactic for raising the reliability of the case study (Yin, 1994).

The case study has been reviewed by the informants from Mobile Arena cluster, the cluster specialist and two other specialists from the field of Information and communications technologies. The investigators conducted only one round of member checking, because of the strict schedules of the informants and the study deadlines.

2.6 Criticism of the methods

The constantly developing socio-technical contexts of this study required a critical and systematic approach to the data collection. The information was critically reflected to different sources that were carefully selected. Using out of date information was avoided and probably too much emphasis was set on this. What comes to the member checking and triangulation the time was not on the side of the investigators either, but under the circumstances the investigators were satisfied to accomplish one round of member checking thanks to the motivated members. Due to time constraints the observations were limited to two occasions and the acquired amount of material did not require working with themes. The investigators gave up with theming possibility in one schedule check-up session. When member checking researcher asks informants examine rough drafts of writing in which the actions or words of the informant are featured (Creswell 1997). A more regular member checking would have been a very important for the reliability of this study.

Like mentioned the possibilities for observing were few and all the opportunities for information collection were to take in short notice. The description of the research methods indicate in several occasions that the investigators were not enough prepared for that or dividing the resources between the literal studies and the field studies. The field studies would have required much more emphasis. As a whole the investigation was restricted due to time limit and the conventional length that service development processes tend to take. The pilot study was done within a convenient schedule and appropriate scale, but the main task of observing the development process of the case itself would have profited from several observing occasions. The investigators did not predict this factor in the research design well enough. On the other hand the investigators were not able to affect for the starting time or length of the service development processes. The problem could have been avoided beforehand though, by selecting other kinds of methods for researching design and development process of Mobile Arena Cluster, but then the study would have lost one important feature from data collection mix. Choosing to have little observational material, instead of other research material, was the most remarkable trade-off that the investigators were forced to make during the design process. The work processes are reliably captured by observing the action (Mwanza, 2002).

3 Presentation of the Mobile Arena, mobile service development and the demo projects

This chapter aims to give a more detailed picture of the contexts in which the Mobile Arena cluster is designing and developing their services. The environment that surrounds the Mobile Arena cluster is explored. The chapter is divided into three main parts that describe: the Mobile Arena cluster and its way to function, mobile service development environment in general and the demo projects that Mobile Arena members participate.

3.1 The cluster Mobile Arena

The Mobile Arena cluster is a mobile cluster within the telecommunication market and was founded 2005 by Preben Larsen, CEO at *PenBook Sweden AB*, Lars Hägglund, CEO at *Netonik Communications*, and Krister Hilmersson, CEO at *Krister Hilmersson*. Their vision was to create a cluster in which companies of different sizes and with various resources collaborate around business, connections and development projects. (P. Larsen, personal communication, May 10, 2006). Today Mobile Arena functions as a non-profit organization and is an open cluster with informal procedures, consisting of independent companies/members. (P. Larsen, personal communication, April 21, 2006). The Mobile Arena cluster specializes in supplying and developing digital services and provides efficiency through big digital service providers for their primary target groups: counties, municipalities, health care organizations and private companies. (Personal communication, ppt-presentation, submitted 2006). Figure 3.2 below illustrates the individual members currently within Mobile Arena in the big circle and in the background the linkages from the cluster to its environment for competition and cooperation. A more detailed description of the individual members is described in Appendix 2.

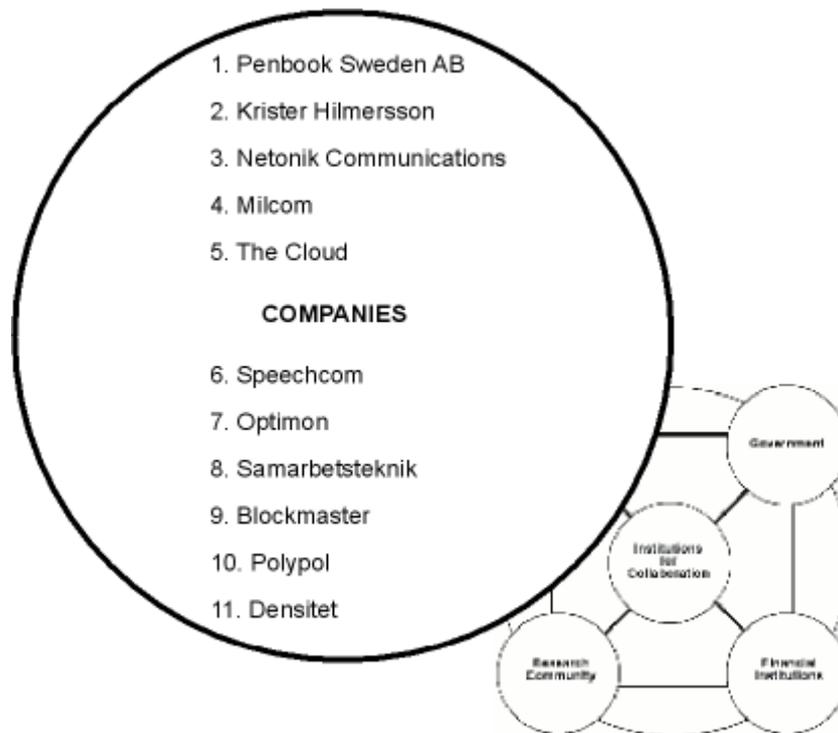


Figure 3.2: The Mobile Arena cluster dynamics and linkages as basis for competition and cooperation (Porter, 1998, modified)

The founders and some other members of the Mobile Arena cluster are running a well-aware recruitment process that aims to attract companies that could be an asset to the cluster Mobile Arena (P. Larsen, personal communication, April 21, 2006). Today Mobile Arena consists of eleven individual members, all with their own networks and connections that may contribute to the future success of the cluster, and the Mobile Arena cluster is currently still growing. The members have at least one thing in common: to develop and offer various digital mobile services both over cable and wireless networks, that fulfils potential benefits for the customer. (P. Larsen, personal communication, April 21, 2006).

The cluster Mobile Arena develops digital services, both mobile and fixed, and the individual members' together offers standard solutions and new combinations of tailor-made products and services to customers. (P. Larsen, personal communication, April 21, 2006). Figure 3.3 below includes a summary of the different products and services that Mobile Arena offers a customer today. There are not so many companies that deliver as specialised services as Mobile Arena to customers. The similar level of expertise could be reached by companies like Sigma with affiliates, WM Data and perhaps TietoEnator. (P. Larsen, personal communication, June 2, 2006).

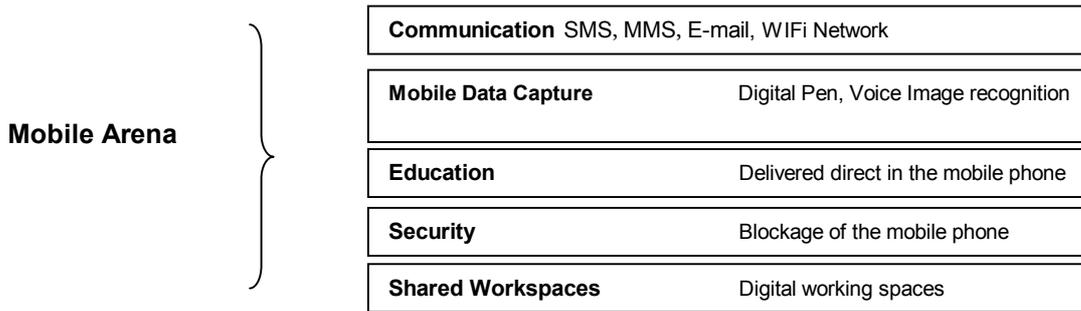


Figure 3.3. Product range of Mobile Arena
(Personal communication, ppt-presentation , submitted 2006, modified)

Currently Mobile Arena (as do many other companies), focus a great deal on how the expansion of IP Telephony lessens the importance of how communication is conducted (either via cable and/or wireless connections). (P. Larsen, personal communication, April 21, 2006). Information transfer over the internet can occur over both fixed and mobile networks (www.sika-institute.se). One of the members, Penbook Sweden AB, explained how IP Telephony allow usage of digital services just as long there is a cable or wireless network available that can carry the service. (P. Larsen, personal communication, April 21, 2006). IP telephony, also called Voice over IP or VoIP can be transmitted over both fixed and mobile networks and used in order to transmit speech and associated services both completely or in part via IP-based networks. VoIP includes besides speech and fax other media as text and images and is transmitted over fixed lines via IP/LAN, over the mobile network via IP/WLAN and via radio links. (www.sika-institute.se).

3.2 Mobile services and the current situation

Information technology Networked Readiness Index (NRI) of Global Information Technology Report, indicates the degree of preparedness of a nation to participate and benefit from ICT (Information and Communications Technology) developments. NRI ranks Sweden on 8th position in the world. (Dutta et al, 2006.) The Scottish Wireless Technologies Research -report concludes the details of NRI and states that from 104 countries Sweden is 4th in technological sophistication, 6th in collaboration in clusters, 3rd in terms of university-industry collaboration, and 4th in investing in R&D. The mobile technology is not the only success factor for countries – it is a tool. It is important to adapt and utilize the advantages that mobility offers. The biggest advantages were found to be increased productivity, lower expenses and possibility for working without being dependent on time and place. (Scottish Enterprise, 2006.)

In the current global environment, innovation and creativity are critical aspects of business success (Dutta & Lopez-Claros, 2006). Companies all over the world have detected the commercial use of mobile services, and that the m-service characteristics like ubiquity, personalization, flexibility, and dissemination promise unprecedented market potential, greater productivity and higher profitability (Wang, Song & Sheriff, 2005). A mobile service is an electronic service that consists of a mobile application or a network, browser, a wireless network and the content, and they play a central role in potential increase in efficiency and re-engineering the processes of companies. (Kanerva & Haapasalo, 2005). There are a combination of features from mobile tele-

communications, data communications and the Internet, i.e. a combination of voice and data services. (Karvonen & Warsta, 2004).

Allowing more nomadic usage – to be constantly available and on-line - will be the next development of mobile communications, a convergence of mobile and Internet technologies. (Lutz, Werner & Jahn, 2000). The challenge is to combine the many solutions currently supported in the core of networks and local platforms, with mobile communication standards. In order to combine these two technologies and support a future mobile environment, companies have to work out an adaptive approach, and create a more heterogeneous service environment. Heterogeneous networks consist of satellite and global access, all connected via an IP core network. The purpose is to provide the nomadic user with a global location independent access to services. (Bianchi, Chan, Holzbock, Hu, Jahn, Sheriff, & Melazzi, 2003).

3.2.1 The IP infrastructure of Sweden

The Internet market consists of a number of sub-markets and one important ground stone for Internet Access is the infrastructure required to transfer Internet traffic. The infrastructure itself can be divided into canalisation, cable and antennae, transmission and IP (Internet Protocol). In order to access to the internet the user has to use some sort of terminal (PC, PDA, mobile etc). The Internet consists of thousands of smaller networks, all based on an IP-protocol, and they are in turn connected via routers which allow various sub-networks to function. (www.sika-institute.se).

Since the launch of the Internet, the term infrastructures have been evolved that refers to integrated solutions based on the fusion of information and communication technologies (ICT). The term is often used to describe national and global communication networks like the Internet and other more specialized solutions for communications. (Hanseth, Aanestad & Berg, 2004). The Internet infrastructure of Sweden consists of a number of major and interconnected operators' networks. These networks are part of the nations backbone network which is a well developed network consisting of a combination of the techniques: fibre optic cables, radio links, coaxial cable and copper wire that support high-speed networks. Many of the Swedish operators are part of major international networks and the Swedish infrastructure is sometimes in fact Swedish segments of international networks with no direct contact in Sweden. (www.sika-institute.se).

3.2.2 Service-Oriented Architectures

Penbook Sweden AB and other members within Mobile Arena used and promoted Service-Oriented Architectures (SOAs) with great enthusiasm (P. Larsen, personal communication, 21 April, 2006), which is one approach on how to ease the design and development of applications on distributed systems. The problems with many distributed systems in the past have been that they were tightly interconnected and closed, and if one component of the system failed, the entire service provided by the distributed system would fail as well. SOA today is a collection of services which can communicate with each other and allows more flexible, rapid and inexpensive integration of new functions. (Lamont, 2006). The idea behind SOA is that by creating standardized interfaces to services, different applications get access to all the services as long as the application knows the interface, despite how the services was initially implemented. In other words by building systems according to SOA, an application can use services from several systems despite the

method the different systems have been built with or what operating system they run on. (Olofsson, 2006).

The technology behind SOA consists of interfaces described in for example XML and services described in Web Service Description Language (WSDL). XML Web Services are not locked to a specific platform which makes it easier to achieve interoperability since many of the providers support Web Services. All communication between services and systems take place via XML. The service can be written in any language as long as the program can use XML for the communication. In order for all the different applications to know what services are available all services are registered in a catalogue called Universal Description, Definition and Integration (Uddi), so that the applications can send a request to the catalogue and use a specific service. There is further a protocol that keeps track on all the communication between the one that request the service and the one that delivers it, called Soap. Lastly all the services have a guaranty for quality, called QoS, which may include who can use the service, how the authentication come about, how the service is to be delivered etc, connected to them. (Olofsson, 2006).

There are several benefits by using SOA. IT departments can reuse old code and build new functions from modular parts (McKean, 2005). One other benefit is that it is more efficient to add new services or upgrade old services in existing systems without losing functionality. Users can accomplish different tasks without having to shift from one application to another. Instead the user can choose to stay in a single interface and launch a process, submit content, or archive a record etc, since the different services needed are being activated as needed. (Lamont, 2006). However, a transition to SOA may create organizational strains since some organisations or public sectors are not able to handle shared services because of the potential fast changes of content, complexity and use between the different sections etcetera (Vasilescu, 2006).

3.3 Presentation of the demo projects

The Mobile Arena member Penbook Sweden AB invited the investigators to be part of and observe two demo projects that the Mobile Arena was working with. The term demo project implicated that both of the demo projects were part a bigger pilot project within the Region Skåne, in which the hospital in Hässleholm had been selected to be one of the first hospitals to elaborate their IT-infrastructure further. Region Skåne is the county council in the region Skåne and has the responsibility of the health care and they have together with three other county councils got the responsibility of the development of the region. Region Skåne cooperates, in order to foster the development within the region, together with other organizations, companies, collages and the regions 33 municipalities. (www.skane.se).

The two demo projects were financed by Vinnova, which is a government authority beneath the Swedish Ministry of Industry, Employment and Communications. Vinnovas's assignment in general is to create conditions for improved welfare and increased employment in Sweden, and their particular area of responsibility was innovations that were connected to research and development (www.vinnova.se). The projects were at different phases in the development process, the first project was in the middle/end phase and had been running since the end of 2005, and the second project was in the early beginning. The two members involved in the demo projects were the companies Penbook Sweden AB and Samarbetsteknik. (E. Mases, personal communication, 21 April, 2006).

3.3.1 The demo project one – digital shared workspace

The purpose with the first demo project was to create a digital shared workspace that eventually should support cooperation between branch head personnel at the hospital in Hässleholm. The working space was to be created using the technology from Microsoft called Microsoft SharePoint which is one of the technologies used by Samarbetsteknik (E. Mases, personal communication, April 21, 2006). SharePoint products enables cooperation within a working team, a company or an entire organization via a network or the Internet and support information sharing on temporary work areas, intranets or extranets. (www.microsoft.com). The working space target users were the branch head personnel at the hospital in Hässleholm, because the branch head personnel would use the digital shared workspace in order to cooperate and inform each other about decisions, meetings, and protocols etcetera. (E. Mases, personal communication, April 21, 2006).



Figure 3.4. Meeting and discussion regarding the digital shared workspace with representatives of the head branch personnel.

3.3.1 The demo project two – the digital billboard

The second demo project was also a project within Region Skåne and involved the same members from Mobile Arena as in the first demo project. The purpose with the second project was to create a digital billboard for the radiology department at the hospital in Hässleholm, which would replace the current traditional billboards that were hanging on several places in the hall outside the nurse's lunchroom/lockers. Its target users were the various personnel at the radiology, and its purpose was to make the information guidance to the employees at the radiology more efficient and legible. The two projects were parts of a bigger assignment to improve the current access of information within the hospital at Hässleholm (E. Mases, personal communication, 21 April, 2006).



Figure 3.5. The meeting and discussion with representatives from the radiology department



Figure 3.6 and 3.7. Two pictures of the current billboard system on the radiology department in Hässleholm. The total number of physical billboards in use was three placed in three different places in the corridor outside the staff kitchen/locker-room.

The problem with the billboard system was that the number of billboards there were three billboards outside the locker room and one more on the other side of the radiology department outside the laboratories. Stuck to the billboards, there was papers attached everywhere in various sections of the boards depending on the topic. This created a somewhat confusing and ineffective information system for the personnel. Certain information had been marked with a mixture of

colours, and it was up to the individual person to get them selves informed in this jungle of papers. Nevertheless the system had been working but was not as effective as the personnel wanted, and it was an assignment of the two members to create a solution, by develop a digital billboard (E. Mases, personal communication, 21 April , 2006).

4 Studying socio-technical environments and service development

The case study is based on the descriptions of the socio-technical environment of Mobile Arena – cluster. In order to define the socio-technical context that surrounds the cluster, a diamond-model of Porter appeared to be most useful. The considerations and decisions for adjusting the diamond-model to the case are presented in this chapter. Several theories were considered to frame the rest of the study - the m-service design process. The findings and conclusions about Actor Network Theory (ANT) and Activity Theory (AT) are also presented. Because the heart of this study is the design process, it is necessary to look into methods that are described as user-centered in Human-computer interaction (HCI) design literature.

4.1 Socio-technical contexts and mobile clusters

As this study aims to identify possibilities for more advantageous clusters with help of cluster literature and empirical investigation, this presentation gives a sight into the cluster as a theory. The cluster approach makes it possible to take into consideration the vast socio-technical context with the aspirations of different actors and rapidly changing competition environment. In this kind of context the competitive advantage can appear or disappear overnight and companies are forced to constantly experiment, re-invent and plan when developing new products and technologies (Yoffie, Cusumano, 1999). Developing new innovative products is one of the most important means for gaining the competitive edge. According to Porter cluster is formed of a group of interconnected companies and associated institutions that act in a particular field, and in a proximate geographic area to gain competitive edge in a specific field (Porter, 1998). The cluster initiatives have become central features in improving competitiveness and growth of clusters, and they tend to focus on technology intensive areas (Sölvell et al, 2003). A mobile cluster is a fast-growing core of a telecommunication cluster that focuses on the mobile side of telecommunications (Steinbock, 2000). Cluster initiatives involve cluster firms, government and the research community and are organized efforts in improving growth and competitiveness of clusters (Sölvell et al, 2003).

In the future consumer will have a more influential role in R&D and in the marketplace (Hirchfeld, Schmidt, 2005). According to a survey of the Economist Intelligence Unit (2006), 85 % of Telecom service providers hope to involve also customers more closely in product development within next 15 years. New partnerships - need for increased co-operation with media, publishing, film, gaming electronic device manufacturing and software companies - are predicted to be necessary in order to keep customers satisfied. (Economist, 2006.) Cluster can be seen as one way of creating advantageous partnerships for succeeding with demanding customer relationships.

4.1.1 There are different kinds of clusters

The clusters vary by many features, but the importance of the strategic differences and innovation is common to all of them. Clusters can be geographically concentrated groups including companies, specialized suppliers, service providers, research community, government, financial and collaboration institutions, firms in related industries and associated institutions in particular fields that compete, but also cooperate (Figure 4.4). Some clusters have active co-operation with state, institutions or universities and some don't. New clusters can arise from government initiative or from one or two innovative companies that stimulate the growth of many others. (Porter, 1998.) Sölvell et al refer to the Global Cluster Initiative Survey (GCIS, 2003) and state that the Cluster initiatives are initiated in 32 % of cases by government, in 27 % by industry or in 35 % of the cases equally by both. The financing is arranged by government (54%), industry (18 %) or equally by both (25 %). (Sölvell et al, 2003.)

There are lots of cluster specific features that vary. Clusters can appear in different industries, both advanced and developing economies and they vary in size, breadth, and state of development. The advanced clusters have deeper and more specialized supplier bases, wider network of related industries, and more extensive supporting institutions. (Porter, 1998.) The cluster initiatives occur in clusters that are of national and regional importance, they have narrow geographical focus, broad international membership and include small companies (Sölvell et al, 2003). The form of a cluster depends on its sophistication and depth. Identifying the cluster and its form requires exploring horizontal and vertical links of a company or group and the boundaries of the cluster could be set between strong and weak links between actors. The boundaries of a cluster continually evolve, and some factors like regulatory rules can contribute to shifting boundaries. Some successful clusters are also more appealing to new participants than others. Even if some threats like direct aiding of competitors may scare the potential participants, the clusters are formed in order to gain competitive advantages. Competition is dynamic and is based on innovation and identifying strategic differences. Close linkages can add to new business formation, innovativeness efficiency and productivity. (Porter, 1998.)

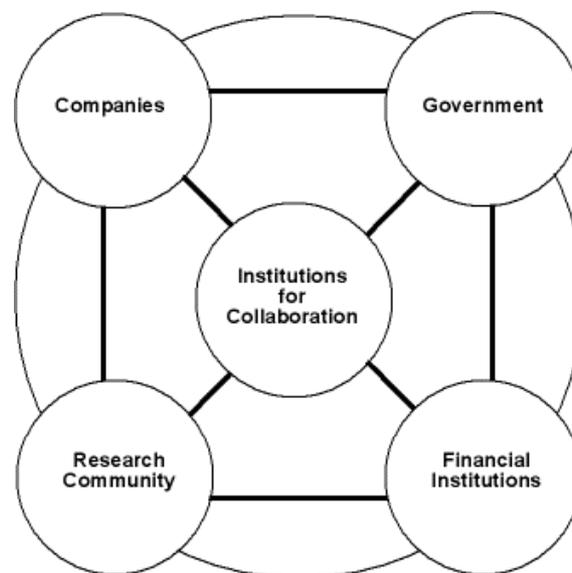


Figure 4.8. Cluster dynamics and linkages as basis for competition and cooperation.

The clusters include combinations of varying interests of varying actors. Porter's diamond model is a framework that combines the aspects of national competitiveness in a structured way and

leads to concrete implications for both companies and governments (Leppävuori, 2002). This study concentrates on a cluster that is of local importance. According to Porter the locational competitive advantage (figure 4.5) includes Factor (input) conditions. In addition to infrastructure, the factor conditions include human, knowledge, capital and physical resources. The demand conditions refer to customer needs and demanding local customers. The related and supporting industries are industries that co-operate with the cluster and for example can share activities in the value chain or act as subcontractors. The firm strategy, structure and rivalry inform the organizational and managerial specifics of the company. It refers to the rules incentives and norms that govern the type and intensity of local rivalry. The factor conditions must improve in efficiency, quality and specialization to particular cluster areas in order to increase productivity of the cluster. The related and supporting industries should be considered as a manifestation of the interactions among all four facets of the cluster diamond. A cluster can be seen as a system of interconnected firms and institutions whose value as a whole is greater than the sum of its parts. (Porter, 1998.)

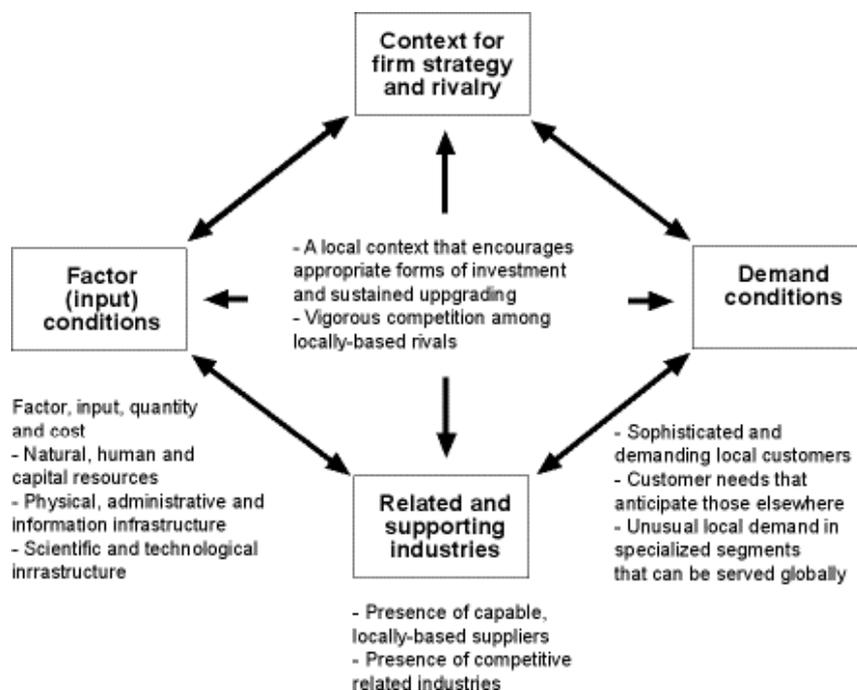


Figure 4.9. The Sources of Locational Competitive adjusted from Porter (1998).

4.1.2 The competitive advantage and successful clusters

The proximity of different actors of clusters has a positive impact on innovation potential and productivity. New partnerships and interactions have become the central focus in the business (Uusikylä et al, 2003). Clusters affect competition by increasing the productivity of participating firms, increasing their capacity for innovation and stimulating new business formation that expands the cluster. Cluster members can gain lower cost access to for example machinery, business services, and personnel. Sourcing outside is not an ideal arrangement, whereas local outsourcing can result lower transactions costs; it minimizes the need for inventory, importing costs and delays of delivery. Sourcing eases communication within the cluster, makes recognizing the market opportunities easier. It also enables lower-cost tailoring or other co-operational efforts. Risks can

be reduced - and buying, offering and marketing efforts are more widely divided and spread. For example participating to the trade shows and the fairs becomes possible also for small firms that are part of a big network. The breadth and depth of a cluster is considered to be more significant for the competitive advantage than the size of the individual firms. In that sense small companies profit from clustering and can become capable of delivering for more demanding and bigger customers. The savings in the expenditures are gained by effective access to specialized information of customers, buyers needs, markets and technologies. The effective access is gained through proximity, linkages and regular personal communication of community. (Porter, 1998.)

The more comprehensive and integrated cluster thinking has generated prospects for new products and services (Uusikylä et al, 2003). The networks as well as the research and development provide better access to the information of the demanding customers in the market. The cluster and the innovation systems approaches share a fundamental drive for putting in place governance structures that are more consistent and comprehensive in promoting innovation and competitiveness. (Andersson et al, 2004.) The co-existing competition and co-operation within a cluster are some of the driving forces of the cluster and also innovation process. The role of actors like customers, suppliers and universities are emphasized in innovation context. (Porter, 1998.) The flexibility, capacity to act rapidly and with considerably low risks create advantages when innovating new products. The proximity, membership access to information and close face-to-face co-operation makes it possible to unite forces of cluster members for example in research and development activities. (Porter, 1998.) R&D has changed the way innovation affects and interacts with the marketplace. In addition to identifying the customer needs, the pace and importance of innovation is a key driver of the rapid expansion of the global economy. (Hirschfeld, Schmidt, 2005.) The customer needs are quickly and effectively identified within a product development environment like Silicon Valley. The proximity plays important role there. The transaction costs are reduced, the creation and flow of information improved and local institutions become more responsive. Clusters offer competition edge in perceiving new technological, operation and delivery possibilities. (Porter, 1998.)

Identifying the success factors of clusters helps in forming the future plans for a cluster. The clusters are favored by new companies for many reasons. The barriers of entry are lower in the cluster locations. The needed skills, inputs, and staff are often conveniently available and can be assembled more easily for a new enterprise (Porter, 1998). The financial institutions, investors and local markets can be more responsive for the more visible group effort. For small new company such trustworthiness and ease of entry is vital. The unsuccessful clusters shrink and diminish in time, but the successful clusters grow and the competitive advantages are further enhanced. What makes a successful cluster? The cluster initiatives are organized efforts to increase the growth and competitiveness of cluster (Sölvell et al, 2003). Successful cluster initiatives share some common characteristics which are listed by Porter:

1. A shared understanding of competitive advantages.
2. A focus on removing obstacles and regular reinforcement of goals.
3. A national structure that embraces all clusters equally.
4. Cluster boundaries that reflect economic reality.
5. Wide involvement of the participants and associated institutions.
6. Private-sector not governmental leadership.

7. Attention to personal relationships.
8. Desire to achieve findings – orientation to the actions.
9. Institutionalization of concepts, relationships and linkages among constituencies. (Porter, 1998.)

The Cluster Initiative Performance Model (CIPM) is based on social, political and economic setting (Sölvell et al, 2003), of which the social aspects are in focus of this study. CIPM (2003) has three components that together get their fulfillment in the fourth component - performance (competitiveness, growth, goal fulfillment). Three components affecting performance are:

1. Objectives including research, networking, policy action, commercial cooperation, education and training, innovation and technology, and cluster expansion (Figure 4.6).
2. Setting including business environment, policy and cluster strength.
3. Process including initiation and planning, governance and financing, scope of membership, resources and facilitators, framework and consensus of beneficial aspects, and momentum.

Giving the headlines for the objectives helps in exploring the cluster as a goal oriented network. The objectives are grouped by Sölvell et al (2003) on a Cluster Initiative Target Board (Figure 4.6). The Cluster initiatives are usually broad and cover in average five or six of the segments. As the cluster initiatives grow older the segment focus tends to get fewer. (Sölvell et al, 2003.) For example the active financial government participation can not be expected to last decades. According to Porter the role of the government is to adjust ideal competitive conditions and providing with stable and equal conditions for clusters (Porter, 1998.) In this sense the role of the government can smooth the path of a cluster all its way.

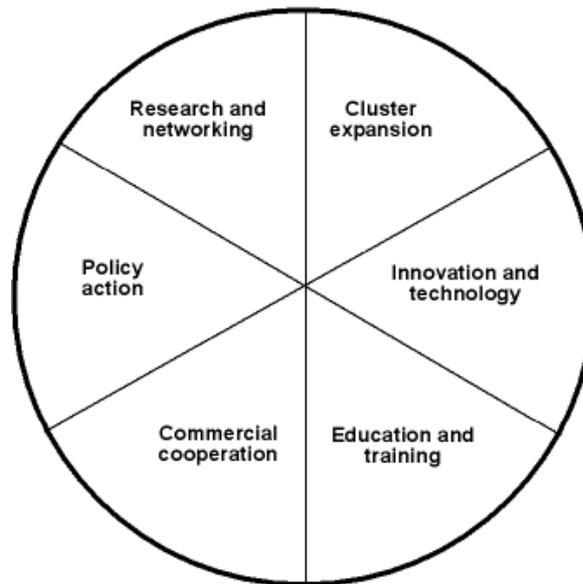


Figure 4.10. The Cluster Initiative Target Board with the objectives (Sölvell et al, 2003).

The cluster initiatives tend to have explicitly formulated vision and nearly 70 % have quantified targets for their activities. Activities performed are selected mostly in consensus. The size of the cluster initiatives is more than ten members in 95 % of the cases and as many as 40 % of the cluster initiatives depend for their future success on one key individual. In general success factors are:

- Social, political and economic setting and high level of company trust in government initiatives.
- Cluster initiatives that serve strong cluster of national and regional importance.
- Competitive process in order to get governmental financing.
- Cluster initiatives with offices and budgets for projects, that do not need separate funding perform better.
- Broad network of contacts and qualities of the facilitator.
- Clear, explicit, shared framework that is based on cluster's own strength.
- Reasonable attention to brand building. (Sölvell et al, 2003.)

Also the innovation is a great success factor in a cluster and indicates cluster's health (Porter, 1998). In the right conditions, innovation will serve as a forceful instrument to realize the potential benefits of clustering, and to counteract the risk of detrimental outcomes (Andersson et al, 2004). The technological discontinuances, shift in buyer needs are examples of the external threats for clusters. Internal threats may arise from company shifts for utilizing other locations leaving space for more innovative efforts in the local space. (Porter, 1998.) More challenges and

threats will be brought up later on. Next the socio-economy and evolution of clusters are presented.

4.1.3 The socio-economy and evolution of clusters

The Cluster Theory combines the network theory and competition. Network theory can add to the information about the way the clusters occur and how they become more productive. The Cluster Theory defines who needs to be in the network and for what purpose. The successful cluster building requires attention for relationship building inside and outside the cluster. The common interest is an important factor. The gained advantages depend on the:

- Free flow of information,
- Motivation for co-operation,
- Improvement and working across organizations.

The trade associations also play an important role and the growth of the network by its members adds to the contacts outside the network. The demanding customers that used to be out of range can become potential members of the bigger network. (Porter, 1998.) This chapter concerns the roles of the companies and trade associations in the socio-economy and evolution of clusters.

There are different kinds of clusters and different kinds of births of clusters. For example a trade association, government initiative, plain chance or a co-operation of two or more small companies can work as the basis of a cluster. The development of the cluster depends on what kind of respond the cluster receives from institutions and suppliers. Also facts like local competition, entrepreneurial conditions for business formation, and mechanisms for binding cluster members together have effect on cluster development. (Porter, 1998.) The cluster members function around the core activity that can be described in a basic value chain: research, development, production, marketing and sales, and distribution. Clusters are dynamic and have a lifecycle (Figure 4.7) that can be represented as a cyclical process containing five stages:

1. Agglomeration means that there are companies and other actors in the region.
2. Emerging clusters are at the early stages of growth.
3. Developing clusters are perceived as having potential for further growth.
4. Mature clusters are stable or will find further growth difficult.
5. Declining clusters have reached their peak and are declining. The clusters at this stage are sometimes able to reinvent themselves and enter the cycle again. (Andersson et al, 2004.) The four last stages of the cyclical process are presented in the figure 4.7.

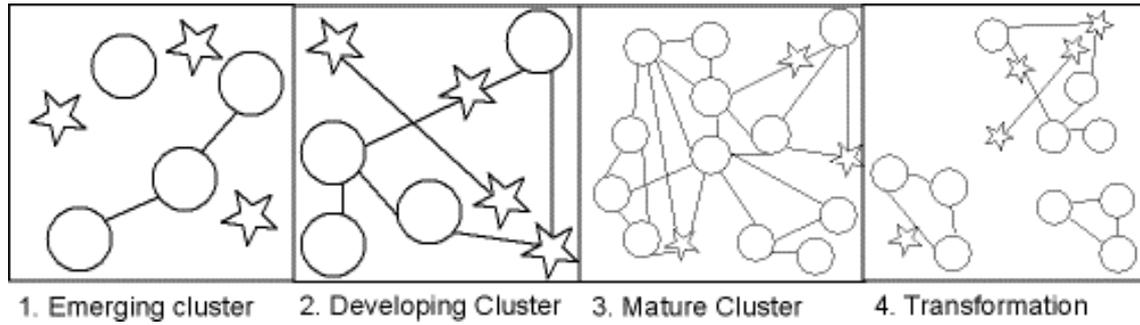


Figure 4.11. The lifecycle of clusters adapted from Andersson (2004).

The close competition between cluster members can be threatening, but in time members realize that they do not directly compete – they complete each other. They share net of specialized skills, services, technology and information. Common efforts like infrastructures, satellite communications or testing laboratories are possible when constructive communication replaces self-serving activities. The public goods may require for example administration and in that sense trade associations could be necessary. There can also be other benefits of founding a trade association of the cluster members. It helps in identifying common needs, constraints and opportunities and establishing new collective efforts. Through the association a greater attention, influence or a new facility for example in form of research unit can be achieved. Associations are especially important for small and medium-sized member firms of the cluster. (Porter, 1998.)

Andersson et al list the four stages of the clustering process: 1. Creation of Trust, 2. Linkages, 3. Vision and Strategic Direction, and 4. Implementation (Andersson et al, 2004). The development from a different approach can be seen in a life cycle of cluster initiatives. Sölvell et al present a life cycle for Cluster initiatives (Figure 4.8). The Cluster initiatives are typically started by a single leader, whose initiative is later taken over by a hired facilitator. Cluster initiatives take at least three years to develop a momentum. When they are mature, the Cluster initiatives can build up structures, or establish an office. They do not increase by budget though. Incubators increase over time, whereas commercial cooperation becomes less important. In the first phase the financial role of government is stronger, but later on the membership fees become more important. It indicates clearly that the cluster is moving from project-based into a membership based organization. Many Cluster initiatives are expected to turn into cluster-based institutions for collaboration. (Sölvell et al, 2003.)

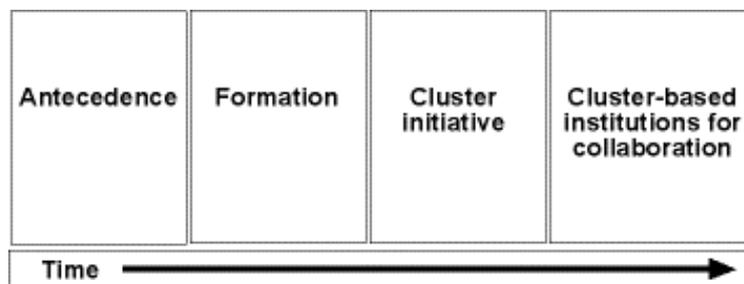


Figure 4.12. The life cycle of the Cluster initiatives modified from Sölvell et al (2003).

Demanding customers will be more important in product and service development. Growing number of consumers are expected to use new information technologies to gather and process more information, to shop for a wider range of goods, and to interact more often with product and service providers. (Hirschfeld, Schmidt, 2005.) The demanding customers are an important part of the clusters and they have a great influence on the development of innovations. The pace of innovation process can be accelerated through cooperation. Through developing their buying practices the customers decide how big the cluster really is. Developing the practices with the local actors can turn out to be beneficial. (Virtanen, Hernesniemi, 2005.) The information generated by the interactions between producers and customers will increase the power of retailers and allow these retailers to play a greater role in defining the goods and services offered. In the future the consumers and customers are expected to give a greater hand in driving product and service innovations. The trend over the past decade indicates that more R&D will be done in cooperation with businesses and customers in the future. (Hirschfeld, Schmidt, 2005.)

The companies and cooperation develops constantly, and consumer market place becomes more integral part of companies' product and service development. Companies are the most influential parties in governing the Cluster initiatives (Sölvell et al, 2003). Even though the birth of a cluster can be identified by one active person, every person in the cluster community has a great effect on the knowledge development in the cluster. The companies need the clusters for their competitive advantage that is created through the cooperation. A company can be part of several clusters at the same time. The creation and organization of the cluster requires discussion and practical operations between the member companies. The cluster is under constant development process and can take unexpected forms and the path of development can be full of surprises. (Virtanen, Hernesniemi, 2005.) Cooperative research within geographically concentrated innovation clusters can weave together a large number of diverse resources and skill sets of the companies. Companies are expected to grow more sensitive to the longer term consequences of demographic, social, and resource issues. More public policy issues will be addressed in the context of joint ventures or alliances between governments and private sector firms in the areas of health and resource development. The greater sensitivity to demographic, social, and resource issues will be part of the better balance between the push of technology and science and the pull of the consumer marketplace. (Hirschfeld, Schmidt, 2005.) The cluster model of Porter is claimed to ignore entrepreneurship, which should be taken into consideration, because it is a great source of evolution in society as well as source of creative energy for innovation and evolution (Leppävuori, 2002). The entrepreneurial activity is integral part of the cluster development (Porter, 1998), and therefore will be considered.

Other actors add to the cooperation and positive competitive conditions of the cluster. The financing organizations are important for innovating companies. The financial support environment of innovations has three different kinds of emphasis: the development of technology as a company-centralized process, the development of the business knowledge as a company-centered process and the development of the systems like innovation environments, networks and clusters. Different organizations and associations can have an important role for undertaking projects and platforms for cooperation. (Virtanen, Hernesniemi, 2005.) Public institutions are present in most main areas when it comes to influencing clusters. Interactions between different actors influence the outcomes of clustering processes. These interactions need to be taken into account by policymakers. Policies need to be designed to accelerate existing clusters and to provide the basis for the emergence of new ones. Cluster approach can help educate policymakers to become more

aware of the actors in the economy and the importance of the incentives facing them. (Andersson et al, 2004.) According to Porter the role of the government is to achieve macro economical and political stability. It has important role also in adjusting ideal competitive conditions and providing with stable and equal conditions for clusters through for example infrastructure, education and timely economic information. (Porter, 1998.) The research organizations add the competitiveness of cluster by providing specialized knowledge. The research units can transfer new, specific theoretical and technological knowledge. The need for basic and specialized knowledge demand flexibility from the educational system. They can provide clusters with valuable resources. (Virtanen, Hernesniemi, 2005.) The clusters often form around large research universities. The corporations work with universities in joint-research projects. What comes to resources, the graduate students provide local businesses with talented and experienced researchers and carry with them networks of formal and informal ties. (Hirschfeld, Schmidt, 2005.)

4.1.4 Challenges and risks for the clusters

The value nets of the cluster face challenges from inside and outside. The more holistic cluster approach has brought about a new understanding of the business logic, which includes a shift from value-chain thinking into a value-net perspective. (Uusikylä et al, 2003). The networking in clusters is associated with a range of potential benefits, but clustering also involves costs and risks. Some clusters turn stagnant, closed, and counter-productive. (Andersson et al, 2004.) A cluster might face division or end up losing some of its members. The cluster members tend to have worries also around the expansion of the cluster, because it might invite unwanted competition and drive up costs or threaten losing valuable employees to rivals. (Porter, 1998.) Even a strong cluster can at some phase of its lifecycle get weaker. Sometimes they disappear even if the age of a cluster can vary from ten years to hundreds of years. The competition, innovations, social capital and healthy development of productivity are vital to a cluster.

There are also some other challenges and risks that a cluster can face. A new growth on the area could be blocked by resources and actors functioning on the same area. The innovation requires healthy competition between the actors within a cluster. The cooperation without competition is dangerous and cluster members should be even more cautious of becoming enclosed inside the brilliance of own cluster. Many opportunities can be lost that way. What comes to economical health of a cluster it is important become capable of functioning without constant support from outside the cluster (Virtanen, Hernesniemi, 2005.)

A cluster needs to ensure that it possess appropriate amount of conflict management skills, variety of competences and reliable information of its own success. The cluster need to pay attention also for development of the competencies, and communication should be promoted in ways that help reconcile conflicting interests. Policy approaches should encourage a healthy division of labor between the actors involved, and enable sound continuous learning processes to different phases of the clustering. Each phase benefits from distinct combinations of competencies, which can be held by several different actors. Processes should be organized and communicated at early stages in ways that can allow for gradual learning and improvement on all sides. (Andersson et al, 2004.) Learning within a cluster is as important as learning from the experiences, functions, failures and success of a cluster. Challenges for finding ways of exploring the breadth and the competitiveness of a cluster are considered valuable (Virtanen, Hernesniemi, 2005). The cluster actors have a lot to gain from appropriate evaluations and coherent frameworks for evaluation are necessary (Andersson et al, 2004.) Evaluating the cluster, its risks, threats and the positive counterparts meet the challenges of the frameworks, measurement and terminology. In order to achieve reli-

able information and to make decisions it is important to be able to compare the different findings with a language that is commonly recognized. (Virtanen, Hernesniemi, 2005.)

4.2 Activity Theory frames the design and development process

The study is aiming to find out how different interest groups interact around mobile service development within a cluster. Framing the service development part of the study brought up Activity Theory (AT), Actor Network Theory (ANT) and HCI design process methods. ANT is mostly associated with the French sociologists of science Bruno Latour and Michael Callon (Stalder, 1997). According to its founder, ANT is not a theory, even if the acronym “ANT”, is very commonly used (Callon, 1999). ANT offer a way to describe a specific society of humans and non-humans as equal actors tied together into Information System (IS) networks, which are built and maintained in order to achieve a particular goal, for example the development of a product (Stalder, 1997) (Akrich and Latour, 1992). Mobile service is the particular goal of its developers and the actions during its development process are in focus of this study. That is why the ANT appeared to be the most appropriate framework for the study. The idea of ANT seemed to fit, but since that did not exactly offer any framing theory and not specifically pointed any widely used method within HCI; instead of ANT the Action Theory, and the HCI design method literature were chosen to guide the service development part of the study. Action Theory has been widely used in describing interactions in designing and developing organizations, AT shares several principles of ANT, and provides conceptual tools appropriate for studying the HCI. (Bertelsen and Bodker, 2003.) It also has potential for providing conceptual tools for understanding practice as well as for guiding practice and its development (Kolari, 2003).

Because ANT has a lot in common with AT it is appropriate to explain some principles of ANT. It has strength and adaptability for researching diversity of non-human and human actors in the networks. (Callon, 1999.) ANT has been criticized, for example Hanseth, Aanestad and Berg (2004) argue that ANT does not provide knowledge of how the interchange of actors works: it is vital to be concrete with respect to the specifics of the technology (Hanseth, Aanestad & Berg, 2004). The dynamics of interaction is not analysed in detail, although different and conflicting interests of artifacts and human actors are involved (Hasu, M., Engeström, Y., 2000). Latour guides scientists and engineers exploring through society and lists the rules of method or procedure - and principles of science in action (Latour, 1987). Some of the principles are guiding this study:

1. Science in action is studied, not ready made science or technology: the process of creating mobile-services - before they are decided or launched – is studied.
2. The human and non-human actions and functions that form the findings and new situation should be considered in the study.
3. Being undecided what the human and non-human interaction is made of is valuable; every time an inside/outside divide is built, the investigators should study the two sides simultaneously and make a heterogeneous list about who do the work.
4. The actions have the vote. Only if there is something unexplained once the networks have been studied it is appropriate to start speaking of cognitive factors. (Latour, 1987.)

People and artefacts should be analysed together since they are interconnected in that sense that modifications in the one affects the other (Latour, 1987). The stability plays important role in ANT. Stability is continually negotiated as a social process of different actors interests (Monteiro, 1987). Networks may become so stable so they become black-boxed or taken for granted (Yoo et al., 2005). Hardware that has turned in to a black box are considered difficult to re-open, unlike software that is constantly being reopened and sealed again mostly because of its fluidity and low production costs (Stalder, 1997). For example the iterative development process of mobile services requires constant intentional re-opening the product or service “black-boxes” for further development.

4.2.1 The widely used Activity Theory in the product development contexts

The reason for choosing Activity Theory instead of ANT for studying mobile service design process is that AT is a theory that is generally said to emphasize motivations and AT is more widely used in the product development contexts. There is need of studies that focus on dynamic, historically constructed situations where producers and users meet, and researchers should develop theoretical and methodological sensitivity for capturing that context (Hasu, M., Engeström, Y., 2000). There has been practical (Kolari, 2003) (Engeström, Y. 2005) and theoretical development (Mwanza, 2002), and this fact adds to the attractiveness of AT. According to the Löwgren and Stolterman technological ideas should be placed in relation to the development of society and culture. Technology always depends on its context. (Löwgren, Stolterman, 2005.) Activity Theory insists on contextual cultural and technical mediation of motivated human activity. The Activity Theory has roots in Scandinavian research on technology use, and design and has been explored as a basic perspective on HCI especially in the Nordic countries.

Activity Theory is focusing on:

- Analysis and design for a work practice including qualifications, work environment and division of work.
- Actual use and the complexity of multi-user activity in analysis and design.
- Development of expertise and of use.
- Active user participation in design and usage as part of design. (Bertelsen and Bodker, 2003.)

AT is a theory developed from the work of constructivist Vygotsky and Leontiev and has clear relation to Computer-Supported Cooperative Work (CSCW) research (Bertelsen and Bodker, 2003). Activity Theory has become an accepted framework to analyse working practices and inform information technology design. The “human factors” and the “cognitive framework” have traditionally been dominating the research, but these approaches lack the conceptual basis for humans as active subjects in a social context. They emphasize ergonomic aspects, whereas organizational processes are neglected. AT takes into consideration these aspects, but has not spread as widely. The reasons why Activity Theory has not had more impact so far are:

1. Its complexity, original language Russian and Marxist philosophical background can be challenging for Anglo-American thinking.

2. Although AT has contributed to a better understanding of collaborative practice it has often failed to provide a hands-on approach to be utilized for IT design. (Lauche, 2003.)

“Activity is driven by a collective object and motive, but it is realized in goal-oriented individual and group actions” (Hasu, M., Engeström, Y., 2000, p. 3). The human activity directs toward material or ideal object, activity is mediated by artifacts and it is socially constituted within a culture. Mediating artifacts can be technical instruments (tools) or psychological instruments (signs). Activity is hierarchically organized system that shows relationships among 3 levels; activity, action and operation.

1. Activity describes the motives and needs answering analytically into question why.
2. Action reveals goals and indicates what is intended to achieve.
3. Operation is the goal directed action. (Bertelsen and Bodker, 2003.)

AT considers human activity as object-oriented and constructed from historical and cultural layers. In the basic structure of activity system (Engeström, 1987) individual or sub-group is indicated as the subject (Figure 4.9). The object refers to the problem space at which activity is directed. Activity is transformed into outcomes with mediating instruments and signs, which can be physical and symbolic, external and internal tools. The same general object is shared by multiple individuals and groups in community. The horizontal division of tasks between members of the community and vertical division of power and status are represented by division of labor. The rules refer to the explicit and implicit regulations, norms and conventions that constrain actions and interactions within the activity system. (Hasu, M., Engeström, Y. 2000.)

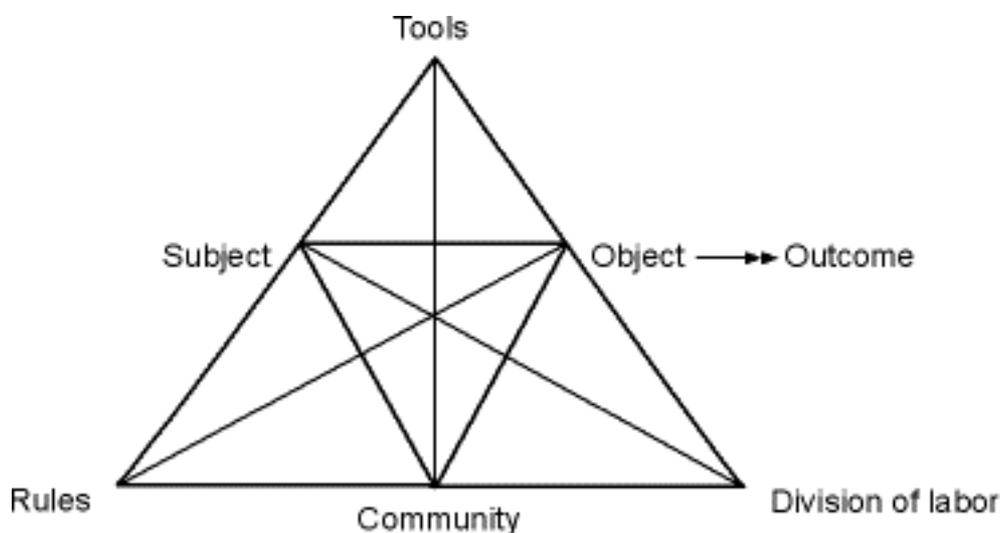


Figure 4.13. The basic structure of activity system modified from Engeström (1987).

Development is a basic feature in AT, and like in ANT, the historically and culturally structured contexts, instability and stability play an important role. The contradictions and instability are part of the development of activity. When researching existing practice AT acknowledges that it is historically and culturally shaped, and analyses help creating links between the past, the present

and the future (Bertelsen and Bodker, 2003). The separate historical layers and different perspectives meet in a development process. Contradictions and breakdowns can be identified in contexts; and mirroring them to the parties involved might lead to re-mediation of the performance and perspectives. (Hasu, M., Engeström, Y. 2000.) Human beings actively create and re-create their own environment. According to the AT people are understood in terms of what they are becoming. This have led to the fact that zone of proximal development has developed to refer to the possible future practices, or potential for development. (Bertelsen, Bodker, 2003.) The future practices, the potential for development, and the human-beings creating their environment, are very important part of this study.

4.2.2 The Key Points of Activity Theory

In this case study the key points of Activity Theory are used as a reference that serve the basic structure of activity system by Engeström (1987). The key points of AT can be used to inform and enhance HCI design by helping the designer to understand: motives, relationships, the historical development, implicit and explicit social practices, the operational structure (division of labor), and issues surrounding the development and use of tools to support activity (Mwanza, D. 2002). The five key factors of AT are:

1. mediating functions
2. internalization-externalization
3. computer artifacts
4. webs of activities
5. development

The mediating functions tend to refer to artifacts, but it can also be seen as other tools like HCI design methods. The externalization and internalization can be referred to these methods too (Bertelsen and Bodker, 2003.) For example when internalizing the collected information an Interaction Designer can use different kinds of probes for getting a picture of the design space. The information load is so big that in order to make sensible suggestions the designer needs to externalize the ideas. Sketching or prototyping can be used for this purpose. According to Bertelsen and Bodker the computer artifacts that function in a web of activities can be identified through the existing practices. The study of computer artifacts in use has to look into the narrow-use activity as well as into the wider context of use and design. It allows the researcher to study multiple levels of activities without establishing a permanent hierarchy in the analysis. The flexible coexisting heterogeneity has been inherited to AT from ANT. (Bertelsen, Bodker, 2003.)

The motives are defined to be the objectives of those (subjects) that are involved in activity. This could mean workers directly involved in activity and managers who may not be directly involved in carrying out activity but regulate how workers perform their duties. Relationships are the collaborations and contradictions that exist amongst those (subjects) involved in activity, for instance relationships that exist within and between subjects involved in HCI Design and Activity Theory. The historical development of the activity forms a background of actors and requires that the designer investigates the methodological background of carrying out the activity that is being studied. According to Activity Theory, such investigations should be conducted in the environment or context in which activity is normally carried out. Implicit and explicit social practices (rules and cultural norms) of the context (community) should get attention of HCI Design

in that context. The operational structure (division of labor) of the activity can be identified in several contributors or participants in a given activity operating at different levels. Therefore, Activity Theory supports the idea of decomposing a complex activity during analysis so as to obtain a detailed understanding of the nature of responsibilities of those involved in activity. Activity Theory requires the researcher to understand components and processes from the point of view of the shared objective of the main activity system being examined. Mediating reminds about the issues surrounding the development and use of tools to support activity. It requires the systems designer to try and understand the kind of tools (both psychological and physical) normally used in the activity being analyzed. The main aim should be to draw insights as to how and why those tools came to be introduced and used in that activity. (Mwanza, D. 2002.)

In practical design and evaluation AT aims to understand the use context with help of check list and mapping techniques though the formalized techniques and methodological prescriptions are yet under development (Bertelsen and Bodker, 2003). Mwanza suggests Activity-Oriented Design Method (AODM) that includes Eight-Step-Model, Activity Notation, Generating the Research Questions and Mapping Operational Processes.

- Eight-Step-Model makes Engeström's (1987) activity triangle model operational by translating the various components in terms of a situation being examined.
- Activity Notation incorporates three operational guidelines that for example help in identifying contradictions, working with sub-activity triangles and dealing with the cognitive complexity.
- The technique of generating research questions operationalises sub-activity triangles findings from the decomposition process.
- The Mapping Operational Processes makes operational processes, entities and links explicit and enhance ease of use of the method. (Mwanza, D. 2002.)

The focus of HCI is moved from the mere interface to the whole work arrangement and to system functionality and architecture (Bertelsen and Bodker, 2003). This study explores the work arrangements around service development. It argues that advanced service development requires multidisciplinary innovativeness, understanding context with its historical constructions, practical HCI design methods and user participation. Hasu and Engeström consider that innovation and redesign in collaboration with users should be regular feature of innovation process (Hasu, M., Engeström, Y., 2000). There is an increasing need for transforming business activities around development and implementation of entirely new concepts, and also an intervention method that allows the practitioners to analyse the need for change. From that ground they can develop and implement the new concepts that can meet current challenges. This requires breaking away from in advance given frames of action and taking actions for transforming frames collaboratively. (Virkkunen, J. 2006.) The idea of collaborative design is included in HCI design by several theorists. The theoretical basis and recommended practical HCI design methods used in different phases of the design process are presented in the next chapter.

4.3 Human Computer Interaction background and methodology

This chapter is dedicated for presenting ideas behind Human-computer Interaction Design and user-centered tools that the design group holds when developing interactive artifacts or services. The focus is on describing methods that could be practiced in the clusters. Maxwell states that human-computer interaction (HCI) attempts to help people with mobile and interconnected lifestyles to meet their goals by making technology accessible, meaningful and satisfying. Designers are challenged to move beyond usability and toward holistic interaction: the scope of Interaction Design should also concern fostering motivation, personal growth, emotional health and individual uniqueness. (Maxwell, 2002.) Holistic interaction is including usability, and many practical usability techniques are presented within HCI design process (Shneiderman, 2005). The International Organization for standardization presents standard ISO/TR 16982:2002 that provides information on human-centered usability methods which can be used for design and evaluation. According to the ISO 9241-11:1998 standard Usability refers to the extend product can be used effectively, efficiently and with satisfaction (ISO, 2006). HCI design affects in more holistic design contexts and usability issues are one of its several other concerns. Preece et al (1994) present factors of HCI: organizational, environmental, health, user, comfort, user interface, tasks, constraints, system functionality and productivity (Figure 4.10). These factors affect the development process.

ORGANIZATIONAL FACTORS training, job design, politics, roles, work organization		ENVIRONMENTAL FACTORS noise, heating, lighting, ventilation	
HEALTH AND SAFETY FACTORS stress, headaches, musculo-skeletal disorders	cognitive processes and capabilities THE USER motivation, enjoyment, satisfaction, personality, experience level		COMFORT FACTORS seating, equipment layout
USER INTERFACE input devices, output displays, dialogue structures, use of colour, icons, commands, graphics, natural language, 3-D, user support materials, multi-media			
TASK FACTORS easy, complex, novel, task allocation, repetitive, monitoring, skills, components			
CONSTRAINTS costs, timescales, budgets, staff, equipment, building structure			
SYSTEM FUNCTIONALITY hardware, software, application			
PRODUCTIVITY FACTORS increase output, increase quality, decrease costs, decrease errors, decrease labour requirements, decrease production time, increase creative and innovative ideas leading to new products			

Figure 4.14. The factors surrounding HCI (Preece et al, 1994, page 31).

The more holistic view of HCI design does not abandon the user. User has become one of the most emphasized factors of development process, and participatory designs have gained a lot of attention within HCI (Preece et al, 2002). Participatory design means having developing team and user representatives actively co-operating in setting design goals and planning prototypes during different phases of iterative design process. It is a process of mutual learning and Carroll et al have identified development in the roles of participating users' knowledge, skills, self-confidence and other professional capacities (Carroll et al, 2002). These consequences add to the quality of work and involve profound goals of HCI design. Participation in design reviews increases the possibility that the technologies will serve human needs in more constructive and positive ways (Schneiderman, 2002). It is useful to remember that the designers or developers are not users, but also the fact that the users are not designers and have their own field of profession to contribute.

A human acting with an artifact has inspired many practitioners and theorists. Hermeneutical orientation and biological theories have led Winograd and Flores to conclusions that tools are fundamental to action and through our actions the investigators generate the world. As designers and users of technology the investigators are engaged in transformation of tradition whether they intend to do it or not. (Winograd and Flores, 2003.) The context-of-use theories are important for mobile devices and ubiquitous computing innovations (Shneiderman and Plaisant, 2005). Human activity is flexible, nuanced and contextualized and information transfer, roles and policies should support human in action (Ackerman, 2002). Also Suchman emphasizes the context of use. The design activity is concrete, purposeful and embodied, and takes place in context of particular, concrete circumstances. There are different ways of human acting in a reality, and action has cultural variations. Circumstances of actions are continuously changing. The designer should aim to imbue the machine with the grounds for behaving rationally and being responsive to the other's actions. (Suchman, 2003.) Designers and users are parties in a number of interlinked and partly overlapping contextual activities that the researchers need to understand in order to make better design and to create better computer artifacts. (Bertelsen, Bodker, 2003). The differences in interests and conflicts in the design process in action can be turned out to be positive and cherish the quality of design through methods like using scenarios and prototyping (Löwgren et al, 2005, Bertelsen and Bodker, 2003).

4.3.1 The Human-Computer Interaction Design process

The study has focus on Interaction Design and it explores from human-computer interaction (HCI) design point of view the design process of mobile services. For any company a satisfied demanding customer is valuable, and Interaction Design involves developing interactive products that support people in their everyday and working lives (Preece et. al., 2002). When spiced with user experience goals these kinds of products can result very satisfied customers. Goals of Interaction Design can be reached and interactive user interfaces developed with help of varying types of methods and design supporting tools. The definitions of user-centred design have three main goals in common, it should: involve user influence, contribute from multidisciplinary knowledge and challenge design with iterations (Preece et al, 1994).

Interaction Design will be challenged in different ways at different phases of the development process. The development cycle includes: contextual data gathering, concept creation and evaluation, and final iteration design (Preece et al, 2002), which define the work field of an Interaction

Designer in concept and product development. The basic activities of Interaction Design can be identified in a simple Interaction Design lifecycle model (Figure 4.11) including:

1. Identifying needs and establishing requirements.
2. Developing alternative designs.
3. Building interactive versions of the design.
4. Evaluating designs.

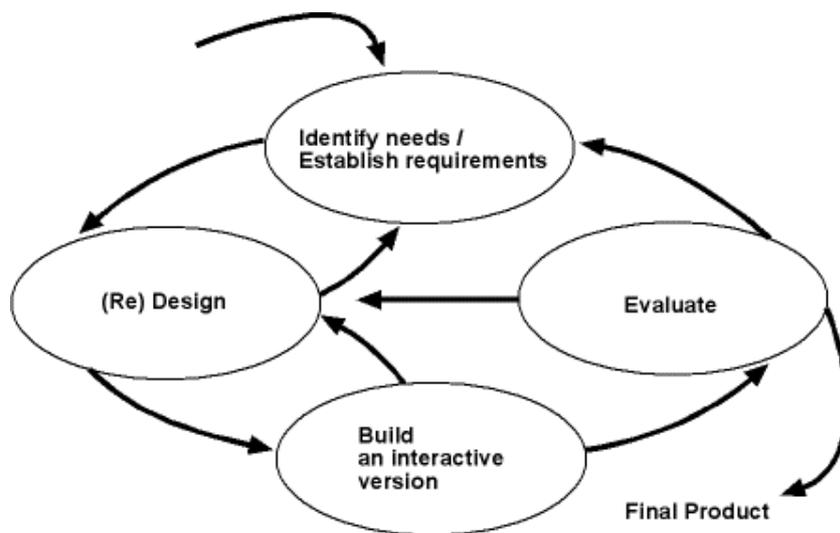


Figure 4.15. A simple Interaction Design lifecycle model adapted from Preece (2002).

The key characteristics of Interaction Design during different iterations are: user focus, specific usability and user experience criteria, and iterative design process. (Preece et al, 2002.) “Making the design process iterative is a way of ensuring that users can get involved in design and that different kinds of knowledge and expertise can be brought into play as needed” (Preece et al, 1994, pp 47). The HCI expertise consists of multidisciplinary knowledge and skills of computer science, cognitive psychology, social and organizational psychology, ergonomics and human factors, engineering, design, anthropology, sociology, philosophy, linguistics and artificial intelligence. Among other professions the design team can consist of managers, system analysts, software engineers, programmers, writers, graphical designers and engineers. Examples of tools for HCI professionals are:

- User centered design methods
- Guidelines
- Evaluation methods
- Software tools

- Principles
- Prototyping tools
- Experimentation
- Creative ideas. (Preece et al, 1994.)

In practice these tools can be used by one or several persons. This mostly depends on the how the companies choose to organize and divide work; employees and other resources.

4.3.2 Designing interactive services or products

One interesting area is inventing new ways to make multiple devices to serve human intentions the best possible way. The quality of service is a growing concern, and keeping the focus around of human needs and capabilities is important when inventing new systems. Design considerations must pay attention to the individual differences, support social and organizational structures, design for reliability and safety (Shneiderman and Plaisant, 2005.) The design activity starts with getting familiar with the problem space or parts of it; user with a task in the environment. In addition to other requirements it is important to define the measurable main usability and user experience goals (Figure 4.12) that function as red thread during the multiple phases of design process. The usability goals are in central role in interaction design and are easier to measure than user experience goals that define the goal for subjective experience of the user. (Preece et al, 2002). The challenging part is to find ways to measure to which extend the goals are reached.

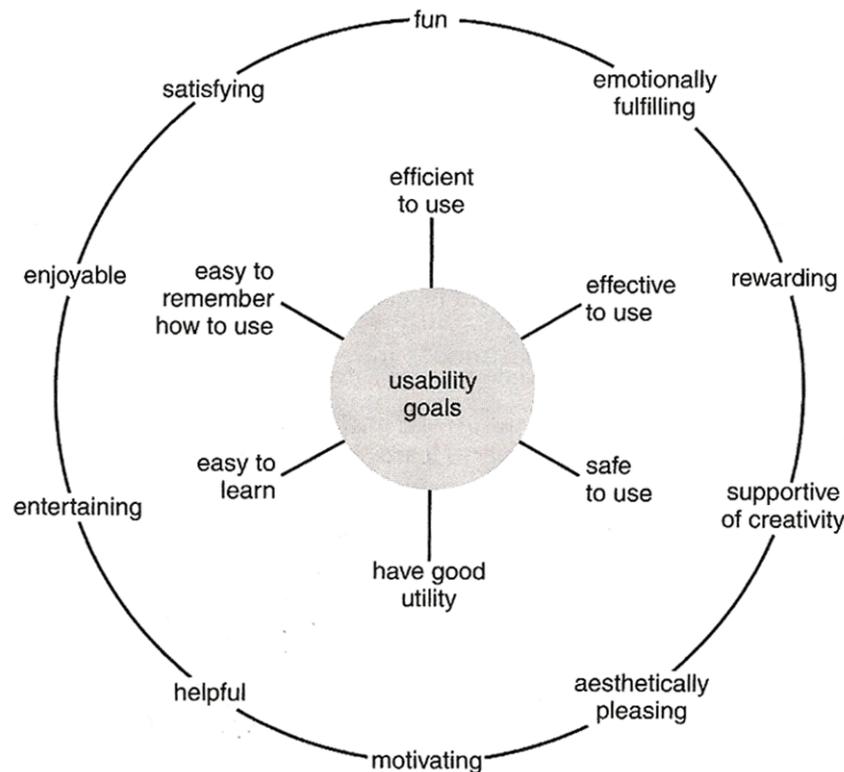


Figure 4.16. The usability and user experience goals listed by Preece et al. (page 19, 2002).

The usability goals can be explained through asking:

- *Effectiveness*. Does the system allow people to learn well, carry on their work efficiently and access the information they need?
- *Efficiency*. The users have learned how to use a system to perform the tasks. Can they sustain the high level of productivity?
- *Safety*. Does the system prevent the user from making serious errors and grand easy recovery when an error is made?
- *Utility*. Does the system provide an appropriate set of functions in order to allow user to do all they tasks in the way they want to perform them?
- *Learnability*. How long takes and how easy it is to learn and get started with the core tasks - and to learn the range of operations to perform a wider set of tasks?
- *Memorability*. What kind of support does the user interface provide for remembering how to carry out tasks, especially if the task is done infrequently?

There are several sets of *design principles or rules* that also guide the design work via the expertise of the design group in action. (Mullet and Sano, 1995; Preece et al, 2002). They are consistent with practical golden rules for designing interfaces: consistency, universal usability, giving informative feedback, prevent errors, permitting easy reversal of actions, support con-

trol of user and reduce users short-term memory load (Shneiderman and Plaisant, 2005). The rules called heuristics are:

1. Visible system status.
2. There is a match between system and real world.
3. User control and freedom is granted.
4. Consistency and standards help in conventional acting.
5. Helping user recognize analyse and recover from error.
6. Preventing errors when possible.
7. Making things recognizable – not necessary to remember.
8. Efficient and flexible use is made possible.
9. Aesthetic design with only relevant information.
10. Provide help and documentation. (Nielsen, 2001.)

In general information appliances should be so simple that a technology can be considered as an invisible tool. They should bring pleasure, be versatile and allow novel creative interaction. Technology should complete user – extend capabilities with the qualities technology is superior to human. (Norman, 1998.) The designer should keep in mind the things that the artifacts are good at and the things that a human is superior.

Sneiderman and Plaisant suggest more research investments in creating specification, usability testing methods, *standards and guidelines* that are valid in designing different kinds of artifacts and services. Guideline helps development of shared language and promoting consistency in terminology, appearance and action. One useful characteristic of guideline is that the users' way to act and communicate naturally is protected with the guideline. Some software development process frameworks include guideline creation as part of the development process (Preece et al, 2002). It is certainly important to document the design decisions and a guideline is a good way to do it.

According to Saddler writing is a one of the ways of externalizing, sharing and making information manipulative. *Scenarios and storyboards* can be written or drawn explanations that portray how a human acts in a use context. Design suggestion can be presented and externalized by *sketching*; expressing idea through varying combinations of text and pictures. (Saddler, 2001) In addition to being a tool for presenting information sketching and scenarios are convenient ways to achieve common language, understanding and objectives between multiple multidisciplinary actors with varying background and expertise (Löwgren and Stolterman, 2005).

In order to control the information overflow and for deciding where more information is needed, the *function analysis* could help in organizing the information. The function analysis expresses what the future product or service should do. The intention is not to define how. The functions can be classified from main function towards necessary, desirable and unnecessary. The function analysis covers the what-questions of designer. (Löwgren and Stolterman, 2005.)

A wide definition of exploration is searching through a space of possible designs or solutions and exploration could be done with Method 635, Innovation by boundary shifting or brainstorming (Löwgren and Stolterman, 2005). How-questions could be approached with different styles of *brainstorming*. Brainstorming aims for generating several ideas or solutions for a problem. There are several techniques for brainstorming. In its basic form a group of people is collected together, they generate ideas without criticizing, and the findings will be structured at the end of the session. (Löwgren and Stolterman, 1999.) In order to make brainstorming more effective it is useful to study different brainstorming techniques. Body storming refers to active search of ideas in “live” environment and can be considered as observation or exploration.

The *future workshop* has participatory basis. It includes work in small groups and requires little more organization and enough persons for forming the groups. The critique phase includes brainstorming session that concentrates on problems. The fantasy phase works with the unrestricted ideas and makes the vision. In the implementation phase each small group present their vision. (Löwgren and Stolterman, 2005.) For broadening design possibilities a series of why-questions can be asked in order to find the way to the roots of the design problem. *Why-why – why analysis* questions the problem itself. (Löwgren and Stolterman, 1999.) Other inquiries are *Contextual inquiry* and future workshop. The contextual inquiry works after three main principles

1. Context: believe in the real work situation; not with what people say they do.
2. Partnership: the future users are experts in their work; involve them in inquiry.
3. Focus: the target of focus varies according to the individual; work for extending the focus. (Löwgren and Stolterman, 2005.)

There are also argumentative techniques that view design as negotiation, random input word game aiming for surprising new ideas through random wording and six thinking hats generating ideas from different points of views (Löwgren and Stolterman, 1999). These can be used for example for preventing fixations during the design process (Löwgren and Stolterman, 2005).

The *personas* are useful way of gaining mutual understanding about design suggestions between different professionals. First several alternatives of the potential main target person are created. One of these personas is selected to represent the intended user, who the whole design group designs for. (Cooper, 1999). Personas are not real persons, but also the real target users can be involved in the design process. Rubin presents advice for usability testing. As soon as there is something to describe - the idea or concept - it can be tested by users. *Usability testing* can be done during all the phases of the design process and it is advisable to start testing already the first ideas, sketches and prototypes. (Rubin, 1994.)

Without addressing the advantages of user-centered design methods, it is important to acknowledge that various methods and techniques are created for making development and design work easier, more cost effective and more user-centered. The most suitable tools can be selected according to the nature of the design situation – it is not necessary to apply all the tools in a project.

4.4 Summary of the theory chapter

This study explores the Mobile Arena Cluster and the design and development process of mobile services. The theoretical framing looked into the Cluster literature having the emphasis on the locational competitive advantages, the success factors of the cluster initiatives, development phases, and the success and risk factors of the cluster initiatives. The clusters appear in different industries, levels of economies and vary by many qualities (Porter, 1998). The qualities of the Mobile Arena Cluster described in the chapter 3 had affect on the focusing on the locational clusters and cluster initiatives. Like mentioned before, the cluster initiatives occur for example in clusters that are of national and regional importance, they have narrow geographical focus, broad international membership and include small companies (Sölvell et al, 2003). Mobile Arena Cluster is young in age but it has already attracted a company from England and two from Denmark. The Mobile Arena cluster possesses a location of several possibilities, an interesting field of expertise. Their specializations combined with the target group from health care sector, are strong indications of the national and regional importance.

The cluster theory has one important part that most obviously connects it to the HCI design: the demanding customers. The demanding customers are interested in benefiting from the services and the performance of the final users is of their interests. On the basis of the literature study the researchers of Mobile Arena Cluster conclude that the demanding customers and their contexts will play a more and more integral part in the design and development processes in the future. Also the important networks with surrounding universities, and attracting more versatile and specialized competences to join the cluster appeared to offer interesting contact spaces between Cluster Theory, Activity Theory and HCI design. The collaboration emphasis is evident. The multiple and conflicting interests familiar to the HCI designers are acknowledged by also within Cluster and Activity theorists. Wouldn't one theory be enough then? In order to cover the wide socio-technical contexts of the Mobile Arena Cluster and to continue deeper into their design and development processes with customers and users none of these theories would alone cover the entire field.

The goals of this case study included intention to profit the Cluster members with some information about, how they could develop their cluster and design and development processes further. To gain this goal it was necessary to explore the clusters, work processes and HCI design processes in general before diving into the contexts of the actual research target: the Mobile Arena Cluster. The figure 4.17 pictures the combination of theories.

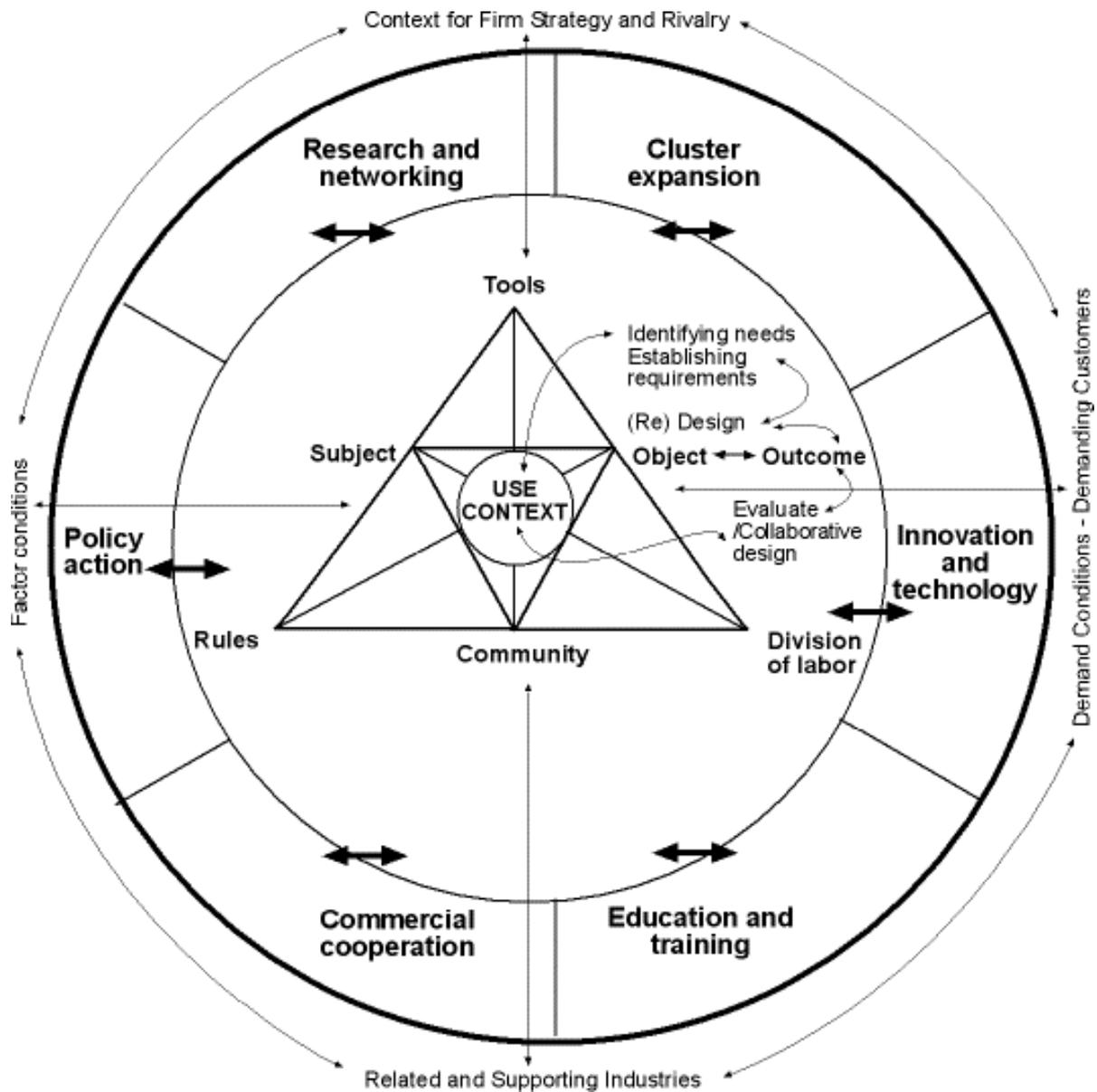


Figure 4.17. The picture concludes the theories that are used. It is based on theories and pictures presented in this chapter; Porter (1998), Sölvell (2003), Engeström (1987), Preece (1994, 2002).

This general theoretical view into Clusters and the design and development processes lead the reader next towards the findings of the Mobile Arena Cluster and the mobile service development processes.

5 Findings and analysis

This following chapter includes the findings regarding Mobile Arena as a cluster as well as the development process within the cluster. The structure of the chapter is based on the goals of this report. The first part aims to describe and analyse the Mobile Arena cluster and its socio-technical environment followed by the second part on how the members within the cluster Mobile Arena interact around mobile service development in a development process.

5.1 The Mobile Arena findings

5.1.1 The Mobile Arena initiative

Behind the initiative of the cluster Mobile Arena was the three founders Preben Larsen, Lars Hägglund and Krister Hilmersson. Their vision of a cluster of companies of different sizes and with various resources collaborating around business, connections and development projects, has resulted in an informal cluster with eleven members that together covered a large area of the digital service market. The cluster initiative was a strategic and economical choice with companies of various sizes and with individual networks collaborated and offered customers a larger range of products/services instead of each member offering solely their own products/services. (P. Larsen, personal communication, April 21, 2006). Mobile Arena can be described as a developing cluster and have the potential for further growth since their collective network is growing fast and they have started to make a name for them selves on the regional mobile service market in Skåne. The figure 5.13 illustrates the lifecycle of the Mobile Arena cluster initiative and the information is based on the collected material through the e-survey. The cycle starts with the past and how the three founders initially founded the cluster Mobile Arena with their vision of a strong cluster that would foster creativity and innovation as to become a strong actor on the service market in the region Skåne. The second step in the life cycle describes the current state of the cluster and how the projects within the cluster were project-based and the organization was informal. The third step in the life cycle can be described as the near future for the cluster and includes all the initiatives and goals the members currently had within the cluster. These goals will be described in more detail after this section. The last step in the life cycle is the potential future. By the time of this study, this future cannot be identified by the investigators, since it takes about three years for a cluster to come to this point as explained in chapter four, and Mobile Arena had only existed in about six months.

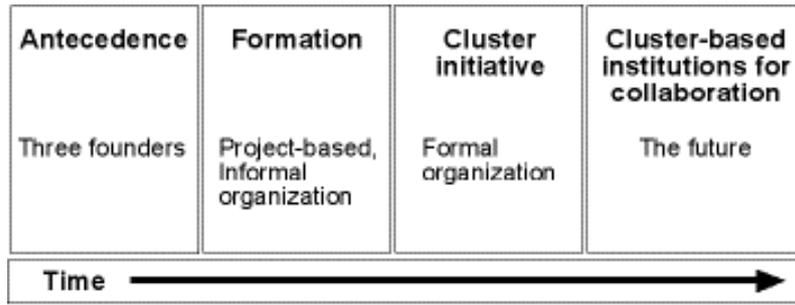


Figure 5.18. The life cycle of the Mobile Arena cluster initiative (Sölvell et al., 2003, modified)

5.1.2 The identified goal oriented initiatives within Mobile Arena

The previous figure illustrated the cluster life cycle of the cluster initiative, and in this next section the investigators will continue to describe the identified goal oriented objectives currently within Mobile Arena divided into six main areas. The following objectives of Mobile Arena described next were mainly identified from the e-survey but also from meetings with one of our contacts; Penbook Sweden AB.

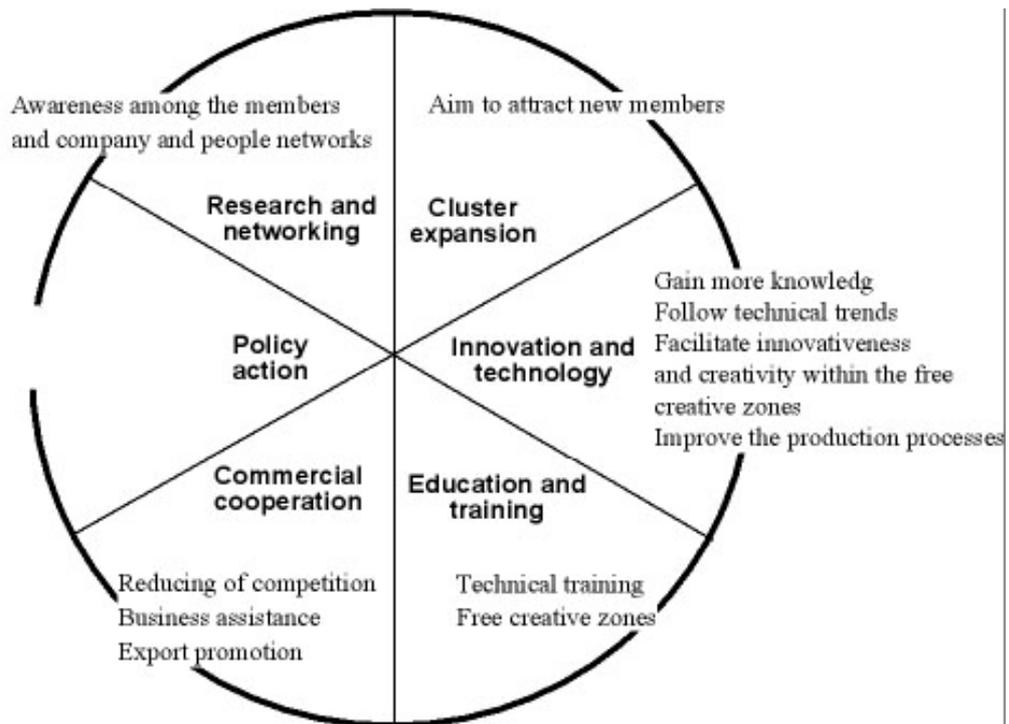


Figure 5.19. The Mobile Arena initiative Target Board with objectives (Sölvell et al., 2003, modified)

The objectives identified within the area *education and training* was technical training happening within the free creative zones. The term “free creative zone” was established by one of the founders of Mobile Arena, Krister Hilmersson, and the idea behind was that companies outside their walls, within meetings, workshops and seminars, could discuss various ideas, experiences and business opportunities more creatively, innovative and support each other. This meant that com-

panies had to trust each other with certain information like new ideas, that otherwise could be quite sensitive. It also meant that the companies could benefit from each others competences “equally”. The goal was to take advantage of each others competence and expertise and shuttle-cock ideas for new services/products, in order to further develop the services within the cluster. (P, Larsen, personal communication, May 12, 2006).

The objectives identified within the area *commercial cooperation* were reducing of competition as the close competition between the cluster members within Mobile Arena was not threatening, and they did not directly compete – instead they completed each other. Within Mobile Arena the members had “silent agreements”, which meant that there were general agreements not to reveal information that circulated within the free creative zones. Other commercial objectives were business assistance meaning that the members offered their individual services/products to the other members, and export promotion meaning that all the members advertised the cluster’s services to customers, potential customers, interest organizations, and related industries in various occasions, with the purpose to spread the word of the cluster and gain market shares.

The objectives within the area *policy action* like the cluster’s infrastructure, regulations, policies and support from the government could at the moment of this study not be identified. However when asked, the member Penbook Sweden AB mentioned that they were to have a meeting discussing certain alterations within the organisation regarding among other things policy actions.

The objectives identified within the area *research and networking* were cluster awareness among the members, and company and people networks meaning that the members within the cluster all contributed in order to increase the total contact network around the network using their individual networks as a starting point. By this procedure, the total network had potential to grow rapidly. The member Penbook Sweden AB had initiated collaboration with the collage Blekinge Institute of Technology. According to the interviewed cluster expert named Jens Sörvik, collaboration with universities would be useful for Mobile Arena cluster. The cooperation could include designing courses that promote students to study the subject that supports the future of the cluster. Incubators, establishment of new firms within the area builds a strong regional knowledge base in the field of mobile services. (Jens Sörvik, 2006.).

The objectives identified within the area *innovation and technology* were there the aim to gain more knowledge of technical standards regarding mobile services, follow technical trends like VoIP, facilitate innovativeness and creativity within the free creative zones, and improve the development processes within the cluster. Since mobile services and VoIP were expanding at the time of this case study, the members within the cluster kept an awareness of that market especially since that market contingently promise a lot of potential in the future and could affect the services of the cluster.

Finally, the objectives identified within the area *cluster expansion* were the members aim to attract new members in order to gain cluster growth. The members frequently searched for other companies that could be an asset for the cluster and the future development of mobile services within the cluster. The competence that was considered most needed in the near future was mainly developers of mobile applications, specialist knowledge regarding the IEEE 802.11 standard and technical knowledge.

5.1.3 The Mobile Arena cluster analysed using the Diamond Model of Porter

For analyzing the Mobile Arena cluster the investigators chose to use Porter's diamond model as a framework. With that model they tried to identify the locational competitive advantage of Mobile Arena containing the cluster's firm strategy and rivalry (organizational and managerial specifics), factor conditions (human, knowledge, capital and physical resources), related and supporting industries (supplier and related industries) and demand conditions (customer needs and demanding local customers). Figure 5.15 below illustrates the various competitive advantages that the investigators identified in this case study through the e-survey. The findings from the survey are explained and analysed below the figure.



Figure 5.20. The Porter factors around the Mobile Arena cluster (Porter, 1998, modified)

5.1.3.1 The Strategy and Rivalry of Mobile Arena

Mobile Arena as a cluster was a form of a system of individual interconnected firms in which companies of different sizes and with various resources cooperated around business, connections and development projects. The cluster consisted of many small companies with only one employee as well as larger companies with over 10 employees that were well established on the global telecommunication market. By being part of the cluster members could choose to operate as a whole rather than as individual parts, companies of different sizes could gain competitive advantage on the mobile service market, and the cluster could come out as a stronger actor on the telecommunication market.

As individual companies all the members within Mobile Arena had their specific customer segments and the locally based rivals within the telecommunication market, depending on what products/services the individual member offered (see appendix 2). A company is not alone in a market, instead they are constantly surrounded by other actors that may affect the way a company work, develop products/services etcetera. We wanted to identify how much the individual member's rivals affected the member's development process and innovation, and therefore we asked the members through the e-survey how much rivals affected their innovation and develop-

ment process as well as their products/services. We gave them the choice to answer on a scale between 1 (not at all) to 3 (very much) and the figure 5.16 below demonstrates their answers.

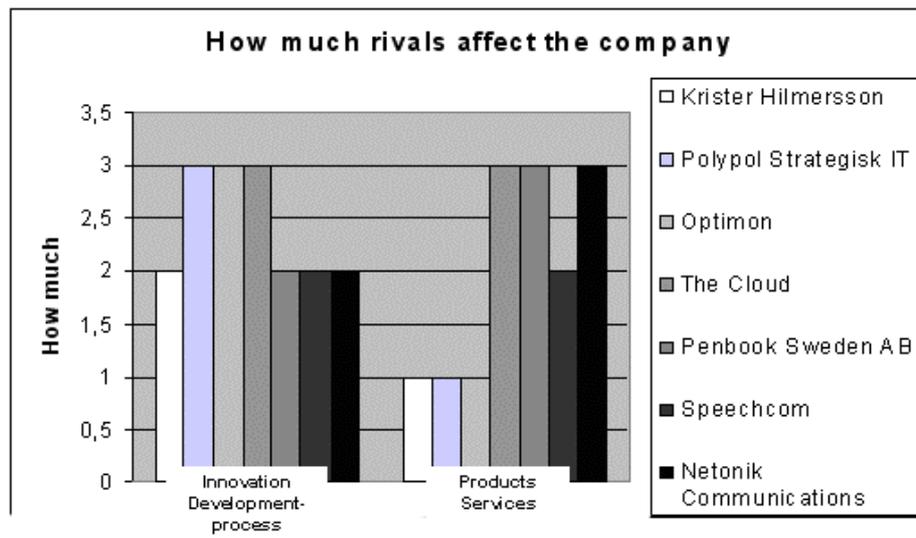


Diagram 5.1: How much rivals affect each member within Mobile Arena.

The answers varied as shown in the diagram above. There could be many reasons for that, reasons like the type of product/service that the member produced, the region in which the member had its base, the size of the company, the competence and much more. Almost all the members that answered the e-survey graded the affect on their innovation and development process (2) much or (3) very much. The reason is probably that the members were attentive to the market changes and planned their future development accordingly to the trends on the market. The three companies that graded the affect the lowest (1) regarding products/services, their business strategy was to differentiate their services, which may have been the reason for their answers as illustrated in the table 5.1 below. However, the members who answered that their rivals did affect their products/services (3) very much also used differentiation as a business strategy. This can be explained by the degree of the differentiation and how many rivals the individual members had within each of their specific area.

Table 5.1: Positioning, business strategy and largest rivals

Member	Positioning	Business strategy	Three largest rivals
Konsult K Hilmersson	Focus	Service differentiation	Small companies
Polypol Strategisk IT	Focus	Strategic development	Systemproviders Managementconsults IT-consults
Optimon	Differentiation	Service differentiation	BlackBoard och Microsoft
The Cloud	Differentiated business model	Product differentiation	Waveport/Netpoint T-mobile Swisscom/Europspot
PenBook Sweden AB	Focus	Service differentiation	Read Soft AB Catrel AB Fruits A/S

SpeechCom Systemutveckling AB	Focus	Product differentiation	SpeechCraft VoiceProvider (no mobile solutions)
Netonik Communication	Consult services	Business consult	Teleca WM Data Elan IT

As individual companies the members may have been more vulnerable and less able to compete on an already busy mobile service market. But as a cluster, Mobile Arena could operate as a stronger actor and attract more customers. Together the members could reach a bigger customer network, and combine new solutions together with other members within the cluster and be able to proceed go-ahead within mobile service development. All these facts limited the number of locally based rivals for the cluster as a whole. Future rivals were expected to be similar clusters/networks as Mobile Arena that generated smaller development projects and mobile services that the customer could test in real situations to a low cost. Such a rival are the Swedish prime example in Kista Science City, which have a strong community of collaborating academics, commercial and industrial organisations involved in wireless technologies (Scottish Enterprise, 2006). The table 5.2 below contains the individual member's answers regarding who they future rivals would be.

Table 5.2: Future rivals

Company	Future rivals
Konsult K Hilmersson	Framework agreement providers
Polypol Strategisk IT	Strategy consults, Internal developers and big IT-companies
Optimon	Microsoft
The Cloud	Pan Europeiska WLAN, operators with similar business model
PenBook Sweden AB	System integrators like TietoEnator, VM-data and CapSogetti
SpeechCom Systemutveckling AB	Not specified
Netonik Communication	Consult companies like Teleca, WM Data, Elan IT

5.1.3.2 Factor conditions of Mobile Arena

The infrastructure within Mobile Arena was based on informal procedures concerning projects, documents, protocols and relationships between the members. This infrastructure was currently a hinder according to the members, since many of them felt that the cluster needed to become more structured in order to gain more success. In the future the members were aiming at a more formalized cluster in order to become more organized and interconnected, with the goal to become a more stable, stronger actor that could compete more effectively for the customers on the market, and also to attract additional members. According to one of the founders, Krister

Hilmersson, a more formal organization of Mobile Arena could create a greater sense of responsibility with the members and the urge to develop the cluster further. Mobile Arena was currently growing fast and the members were about to become 14 instead of 11 by the time of this case study. The members within Mobile Arena covered a large area of the telecommunication market and of their individual customer base. The cluster had great potential to attract valuable members and continue to expand. Mobile Arena as a whole contained a wide range of competences, everything from telecom and IP networks, to organization management and new technology. Many of the members within Mobile Arena consisted of only one employee (see appendix 2), i.e. the owner/CEO and were specialized in their different areas.

The financial and physical resources supporting individual members in the cluster came from both internal as well as external parties. Various private and/or public financiers were customers, ALMI, the European Union, VC and other financiers. These financiers did not finance the cluster in it self but instead the individual projects of the members. Usually the individual customer paid for the costs, but in other cases the individual members within Mobile Arena stood for the financial resources regarding development of their own products/services. The physical resources that surrounded Mobile Arena and its members were quite limited since the cluster was dealing primarily with mobile digital services. Examples of physical resources used were WLAN access nodes and servers, development tools etcetera from provides like Microsoft, Ericsson, AS Group, Dell, TDC/Song Network, Nuance, Nokia, Intel and Vision Object etcetera. Some members packaged and sold other companies products as a concept that was focused on a specific business or company.

Since most of the clusters customers had their base in the region Skåne or nearby, Mobile Arena was dependent of the local internet infrastructure in order to provide their digital mobile services. The region Skåne consisted of a high developed IP infrastructure existing of internet access through both cable and wireless networks plus telephony and other external networks. The Region Skåne, The Skåne Association of Local Authorities and the counties agency in Skåne worked with a joint project called BAS. The project allowed the previous isolated networks within the region to become connected with each other, to the rest of the region, to the nearby region Halland and over the Öresund which consisted of the Southern Sweden and the Copenhagen region of Denmark. The purpose with the project was to offer users within these areas access to the entire region Skåne through one connection (www.skanet.se).

5.1.3.3 Related and Supporting Industries of Mobile Arena

Although the Mobile Arena was formed in 2005 and were quite young, the members had already developed relationships with various financial and collaboration institutions, universities and firms in relating industries. The related and supporting industries of Mobile Arena cooperated with the cluster and could share activities in the value chain or act as subcontractors. In the past until 1983, value chains were quite simple given that network operators managed the whole chain. Then 1 generation (1G) and wireless communication brought in equipment manufacturers, and 2 generation (2G) in turn brought in value added digital services. Today in the 3 generation (3G) value chains, developers are no longer in the middle, instead application development/value creating and the satisfaction of the market needs is (Steinbock, 2003, referred in Karvonen & Warsta, 2004). Mobile markets and wireless value chains are now more complex, and because of that, companies like the companies within Mobile Arena already have done, are forced to specialize within the telecommunication market (Karvonen & Warsta, 2004).

The figure 5.16 below shows a typical value chain for digital services within Mobile Arena and describes what kind of actors that surrounded the cluster. In the back of the chain were technology vendors, followed by hardware providers. Next Mobile Arena worked as a service provider

creating digital services and resided in the middle of the chain. Occasionally customers felt less trust to a individual member or the entire cluster since there were not as well known as bigger actors on the telecommunication market as TeliaSonera for example. In those cases, bigger system integrators like SAP, VM Data, TeliaSonera etcetera, operated as a middleman between Mobile Arena and the client. For small new companies such trustworthiness and ease of entry is vital. Last in the chain was the final user who was not necessarily the same as the client. A client could be a public sector who would later provide the service to the actual end users, an administrator for example.

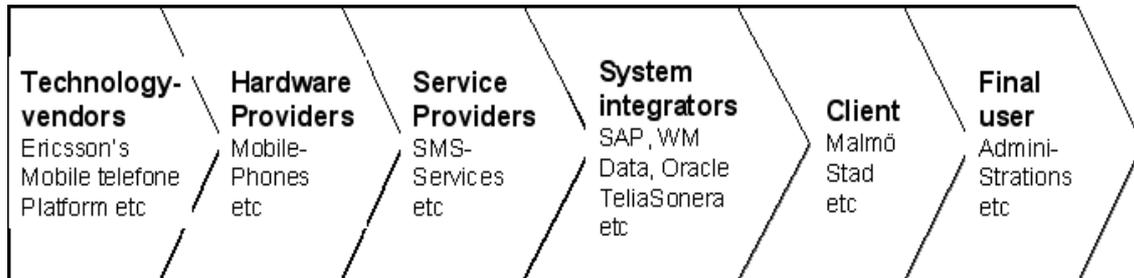


Figure 5.21. A typical value chain for digital services
(Personal communication, ppt-presentation, submitted 2006, modified)

5.1.3.4 Demand conditions of Mobile Arena

The main target groups to the cluster were counties, municipalities, health care organizations and private companies (P. Larsen, personal communication, April 12, 2006). According to the e-survey, these target groups were to some of the members, target groups even before they entered Mobile Arena, but in some cases the customers became customers solely because of the company's membership in Mobile Arena. In addition to the primary target groups were customers within the financial sector, process industry and various insurance companies. Customers to Mobile Arena did not necessarily want to know the technology behind the services of Mobile Arena, instead they looked for services that worked and that could be integrated in current systems. In order to oblige this request, Mobile Arena used the approach SOA which are explained in more detail in chapter three. (P. Larsen, personal communication, April 12, 2006). By the answers from the members, the customers of Mobile Arena required mobile services of high quality that could handle long range, was usable, of low price that contained sufficient information. Besides the service, members within Mobile Arena tried to attract new customers by offering the benefit perspective to their customers. The perspective involves that the customer gains certain benefits by using the service by rationalizes the way to work. This perspective was anticipated to play a big role within the mobile service market in the future according to the member Penbook Sweden AB. (P. Larsen, personal communication, April 12, 2006). The individual members within Mobile Arena came from Sweden, Denmark and the UK and contributed to the cluster with their various specializations within telecommunication as described in chapter three.

The Diagram 5.2 below illustrates how aware the individual companies within Mobile Arena were regarding research, new technology and market changes. As demonstrated the members were quite aware of the various areas with small disparities. Since the telecommunication and mobile service market is a turbulent market the members kept themselves updated about new technology and market changes in particularly. Regarding future trends of mobile services, the members answered that customized solutions, adjustable generic solutions, increasing mobile digital solutions of low cost and great flexibility were of importance to the cluster and the indi-

vidual members.

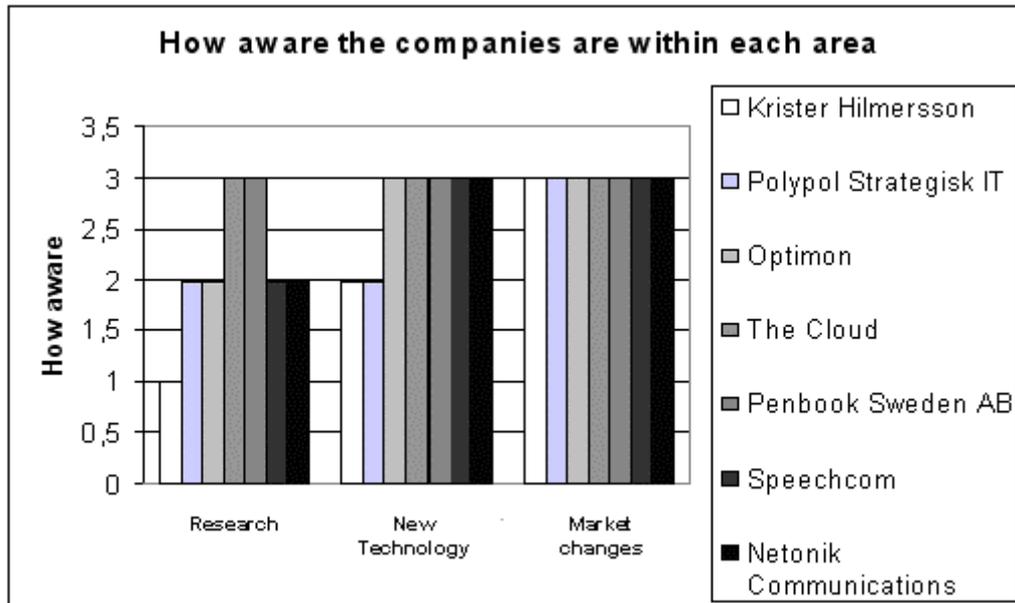


Diagram 5.2. How much the individual members were aware of changes within research, new technology and market changes.

Being part of the cluster Mobile Arena, the members can cooperate and offer its primary target groups, counties, municipalities, health care organizations and private companies, standard solutions and new combinations of tailor-made products and services to the customers (P. Larsen, personal communication, April 12, 2006). Focusing on the health care and wellness section offers great businesses potential. Mobile services maybe valuable assets within the health care section in many ways. Mobile services can work as an aid for elderly and home care personnel in a form of voice communication, of reporting of actions/operations when visiting the patient's home and a mobile system for supervising of work or for increasing the security of persons working and making visits in homes. (Wallström, 2006). As a member of Mobile Arena they can reduce costs and increase earning and please more customers by offer those bigger packages consisting of products and services from several members within Mobile Arena, in contrast to each company offer their individual services. (P. Larsen, personal communication, April 12, 2006).

5.1.4 The attitude of the members towards the cluster

The investigators have brought up many benefits and downsides to the cluster, but also relevant for the future success of the cluster is the attitude that the members have regarding their membership in the cluster. Therefore the investigators asked the members through the e-survey to mention any benefits or downsides that the membership in the cluster had generated. Below is a summary of the identified benefits and downsides collected via the e-survey. Many of the members who answered wrote similar answers, and they all agreed on that the biggest issue with the clusters current state was the fact that it was to unorganized.

Benefits

- Smaller companies could benefit from larger companies within the cluster
- As a cluster the companies could act as a whole and therefore as a stronger actor on the market
- Together the cluster was able to offer a stronger concept to customers
- Within the free creative free zones, the members could share experiences, knowledge and resources with each other
- Collective advertisement
- Wider networks
- Large area of competencies
- Larger customer segments

Downsides

- Some members contributed more to the cluster than other members
- Current lack of organization created a somewhat unfocused approach within the cluster which made it difficult to expand and improve the cluster

5.2 Future possibilities for Mobile Arena as a cluster

The Mobile Arena cluster can face several possibilities and threats from outside and inside. As the future possibilities are emphasized in this study, the questions asked from a cluster expert inquired mostly the advantages and possibilities of Mobile Arena cluster (attachment of the questions already in chapter 2). It is worth mentioning though that in the Mobile Arena cluster there are a limited number of firms, which connect them tight together, and as a consequence the firms can become tied to using specific partners, the cluster can become closed and loose out on innovativeness (Jens Sörvik, 2006). It is also recognized that for almost every advantage and possibility there is always a counterpart of disadvantage and threat.

The Mobile Arena cluster could measure its success in the markets by listing the number of new clients, increased incomes and revenues, the growth of the firms in Mobile Arena cluster and the amount of innovations or products Mobile Arena cluster develop (Jens Sörvik, 2006). By measuring the success of the cluster makes it possible to compare Mobile Arenas condition to the conditions of the competitors. The regular measuring provides the Mobile Arena with the tools of following up their development and supporting the marketing communications.

Some practical examples of how to attract new participants according to Sörvik (2006), in the cluster can be listed.

- The Mobile Arena cluster could arrange theme nights; that with seminars and networking provides a meeting place for different stakeholders such as developers from large firms, purchasers from public sector and large firms, academics etc.
- Joint business development projects could be managed by the Mobile arena cluster. The project could function as a tool for financing the developing of new ideas around mobile services. For example Teknopol, Region Skåne, VINNOVA, Länsarbetsnämnden, Trygghetsrådet, MINC in Lund and Malmö, and Ideon Innovation in Lund have set up a Business Arena Imaging, where they have set-up joint business development projects. The new ideas are combined for a set period of time in cooperation with management and labour resources with a goal to develop a business idea, which can benefit different firms.
- A Cluster leader for Mobile Arena could be hired, either from public funding or from resources from each firm. “*This cluster leader could be assigned to try to find new business opportunities for the firms, and also to develop joint packages to offer to potential clients.*” (Jens Sörvik, personal communication, June 1, 2006)

The Mobile Arena cluster could develop a competence matrix that concludes which kind of knowledge exists in each firm. It also defines which competence can be accessed by the other members and increases mutual knowledge and awareness about companies that function in the cluster. (Sörvik, 2006.)

According to Sörvik, the Mobile Arena cluster members can promote their future success and utilize several surrounding possibilities. Marketing and promoting their strengths at international conferences and collaborating with IT in Öresund area are some of the alternatives. There is possibility to promote and position the strengths of Skåne region as an international forum for companies. The location can be used to attract new customers and large firms that can function as customers. The Mobile Arena cluster could aim to involve into the cluster some of the large firms that exist in the region. (Jens Sörvik, 2006.)

5.3 The development process within Mobile Arena

5.3.1 *The development concept within Mobile Arena contra the AT*

In this next section the development process will be analysed using the AT. In short; the activity being analysed is the development process of Mobile Arena, which included the action to create the two services for the customer at the hospital in Hässleholm, and the goal directed operation of meeting the customer’s requirements.

Activity – Development process

Action - Development of services

Operation – Meet the requirements of the customer

The action of the collaboration in the development process served the purpose to offer and de-

velop the service that the customer had requested and this action revealed the goals with the activity and what was intended to be achieved; to succeed to meet the requirements from the customer, demonstrate the cluster Mobile Arena and its services with the intention to attract more customers. Since the two demo projects were part of a larger assignment to improve the current access of information within the hospital at Hässleholm, these projects could create future projects for the cluster and the services within Mobile Arena could get a lot of publicity within the wellness and healthcare sector. The operation which is the goal directed action is in this case the actual development process which can be analysed using the basic structure of the activity system. The figure 5.17 below shows a summary of the observed development process within the two observed demo projects.

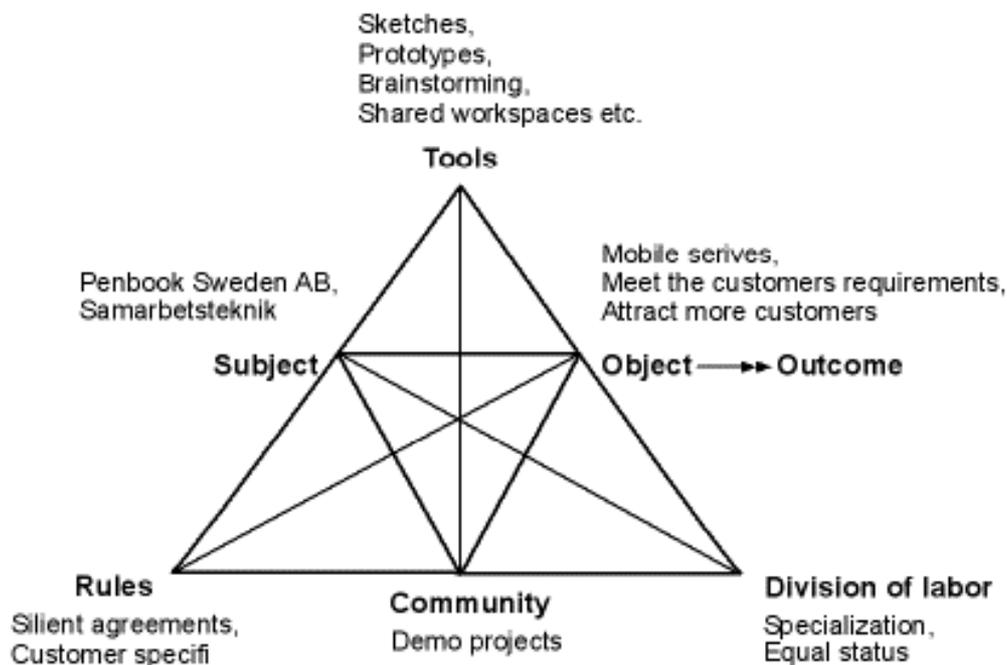


Figure 5.22. The Basic Structure of the activity system of the Mobile Arena (Engeström, 1987, modified)

The following text is based on the figure 5.17 above and explains the activity system of the development process in the two observed demo project. In the observed demo projects the *subject* is the two members within Mobile Arena, Penbook Sweden AB and Samarbetsteknik. These members are mentioned here only because of the two observed demo projects, but the subject in the activity system otherwise could include other members from the Mobile Arena cluster that are part of a development process.

The goal of the development process is placed on the opposite side of the triangle and is called the *object* to which the activity is directed. The object in the observed demo cases is the creation of a digital shared workplace for the branch head personnel and a digital billboard for the radiology department. This object is connected with the outcome which in this case is to meet the requirement of the customer and also to attract future assignments from the same customer or other customers perhaps in the wellness and healthcare sector.

In order to actually create the object/outcome, the members used *tools*. The tools used in the

demo projects can be divided in tools for developing the service (software, hardware etc), tools for communicating within Mobile Arena (digital shared workspace, e-mail, telephone, brainstorming etc) and tools for communication with the customers (sketches, customer specification, prototypes, brainstorming, user cases etc). The services (object) are shared between the involved persons within the demo projects (*community*) which is the context in which the action occurs.

In order to develop the services (object), there are a horizontal *division of tasks* between the involved members in the demo projects (community). The labor is divided by the members and is based on the individual member's specialist competence. Penbook Sweden AB initiated the contact and Samarbetsteknik mainly developed the services (objects) since it was their technology that the services were based upon. The division of labor within the two demo project can be presented by a vertical division of power and status. The member Penbook Sweden contacted the member Samarbetsteknik after meeting the customer, but the division of power and status was equal.

Finally, in an activity there exist certain *rules*, which limit the actions and interactions within a activity system (figure 5.17). Mobile Arena was a quite informal cluster with informal rules between the members, and therefore the rules were not clear in the observed development process. Nevertheless as explained earlier in this chapter there existed "silent agreements" within Mobile Arena, which means that there were agreements not to reveal information that circulated within the free creative zones. Another set of rules that affects the demo projects is rules within the customer's community, the wellness and healthcare sector.

5.3.2 *The development concept within Mobile Arena contra HCI*

Every development process poses unique challenges and the observed development process within Mobile Arena was no exception. Developing services/products like a mobile digital service requires various resources like personnel, competence, financing and time among other things, and the people involved have to be able to collaborate, communicate and aim for a common goal. In order to communicate and achieve the common goal the final service/product, they use various tools, both physical and symbolic. (www.webstyleguide.com)

Before the development process is described in more detail, the typical service development concept within Mobile Arena and the innovation process that occurred within the cluster, is illustrated in the figure 5.18 below. The function of the figure is to capture how members develop services within the walls of the cluster. Perhaps the most important step in this development cycle is the free creative zones. (P. Larsen, personal communication, April 21, 2006).

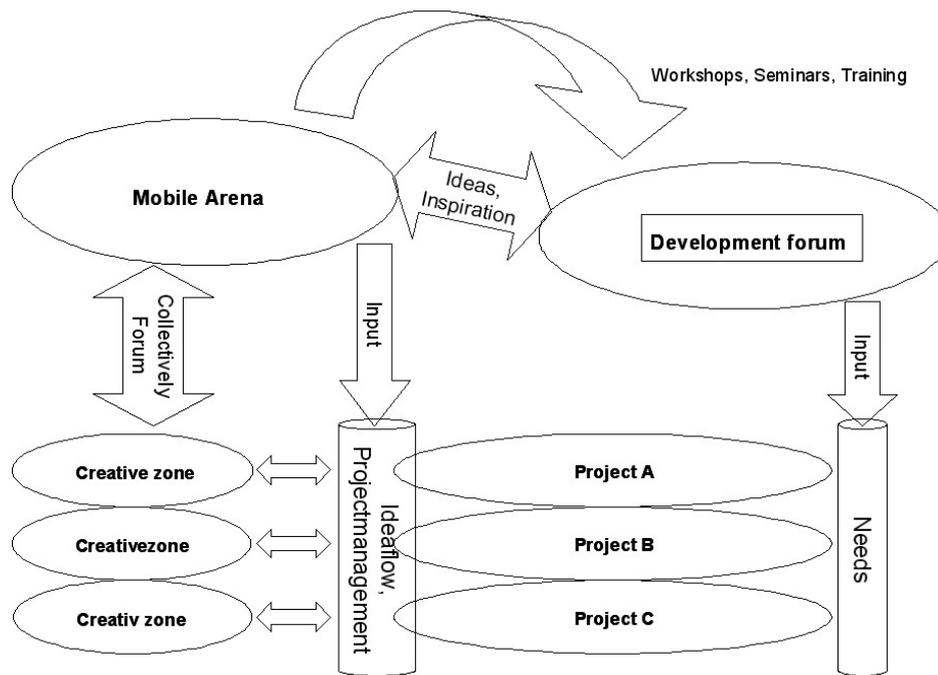


Figure 5.23. The typical service development concept within Mobile Arena (Personal communication, ppt-presentation, submitted 2006, modified)

The figure 5.18 and the development concept of Mobile Arena, is explained further in the following description of the development process within the cluster. Since every development process is unique, the two observed development processes cannot be regarded as the exclusive development process within Mobile Arena. In fact, there were some details that were unique for the two projects, for example the persons involved and specific details regarding the customers at the hospital in Hässleholm. These details, will in the description of the development process within Mobile Arena, be brought up as demo project specifics. However the importance of those specific events will be put into context of the general development process. As already explained in chapter four, the investigators used a simple Interaction Design lifecycle model in order to have a high-quality example to compare the development process within Mobile Arena to. This model is described in chapter four, and has worked as a template for the following narrative of the development Process within Mobile Arena.

5.3.3 Identify needs and establish requirements

Important to mention is that demo project one had lasted since the end of year 2005, and had gone through more iterations than the demo project two which had just started at the time of this study. In both of the demo projects the customer (The hospital in Hässleholm) was the same; however the representatives from the hospitals involved in each demo project, was not. Who the representatives were in each project is explained in chapter three.

A project within Mobile Arena can start either by a customer contacting a member/s of the cluster, or a customer being contacted by a member/s. The two observed demo projects had the purpose to sell a service to the customer. A project with the purpose to sell a service to a customer generally starts with a briefing with the customer about what services Mobile Arena could offer, and if the customer is interested they provide the member/s from Mobile Arena a kind of inven-

tory of demands and needs. (E. Mases, personal communication, May 12, 2006).

The first demo project followed the general initial procedures just described. Penbook Sweden AB stated the first contact with the hospital in Hässleholm. During meetings together with representatives from the hospital, Penbook Sweden AB presented the services that the cluster could provide and how the services could be beneficial to the customer. After the initial meetings with the representatives from the hospital in the first project, the involved decided to obtain the services provided by the cluster. (E. Mases, personal communication, May 12, 2006).

Depending of the nature of the project, after the initial contact with a customer, the member/s contacts other members within Mobile Arena that would be able to contribute to the project. Not all members within the cluster are involved in all projects (P. Larsen, personal communication, April 21, 2006). Based on the needs of the hospital in Hässleholm Penbook Sweden AB contacted Samarbetsteknik who was the member within Mobile Arena who was specialized in the kind of service and technology that the customer needed in the first demo project. The two members; Samarbetsteknik and Penbook Sweden AB, had worked together several times in various projects before these two demo projects, with great success. (E. Mases, personal communication, May 12, 2006).

After the selection of suitable members had been contacted and involved within a project, the members' starts to discuss the material and needs of the customer, within the free creative zones as explained earlier in this chapter. Within the free creative zone, discussions emerge regarding to solutions, ideas for new technology, businesses etcetera. The outcome could lead to no offer at all, if the involved members do not want to or could not develop the service the customers want. In other cases there will be an offer that is handed back to the customer. (P. Larsen, personal communication, April 21, 2006). After the member Penbook Sweden AB had contacted the other member Samarbetsteknik, they together discussed what the hospital needed and how they could provide the customer with a solution. The solution was formed to an offer that was handed over to the hospital in Hässleholm.

In the first demo project the offer was accepted by the customer and the project started and continued to the next phase. In the next phase, the members together with the representatives explored the design space, in more depth, trying to identify all the needs and in what context the service should function in. The areas explored were the organization of the hospital, work procedures, terminology, and other details needed for the development of the digital shared workspace. The meetings with the representatives from the hospital were in their natural environment at the hospital, where the member/s together with the customer discussed the specific details around the services. The representatives functioned as spokespersons for the final users, and provided the Mobile Arena members with material and information about the organisation, procedures and users for the continued design of the service. (E. Mases, personal communication, May 12, 2006).

By the time of this study, the second demo project has just started, and this project was a continuation of the first demo project. However it was not yet decided weather the Hospital in Hässleholm and the radiology department wanted to accept the offer of a digital billboard provided by Penbook Sweden AB and Samarbetsteknik. The meetings in the second demo project was still at an early phase, where the member/s and the representatives from the hospital discussed if and how the service would be beneficial to the radiology department and the hospital in general and if the hospital could afford it. The decision had to be made on a top level in the hierarchy organisation of the hospital, before the offer could be accepted. Nevertheless, until a deci-

sion had been made by the management at the hospital, the members together with the representatives begun to explore the design space at the radiology department and develop the digital billboard. (E. Mases, personal communication, May 12, 2006).

The figure 5.18 above describes the development concept and how the individual members within the cluster remained in contrast with each other when they develop a service together. This concept is the one sold and explained to customers and other outsiders. In excess of this concept there was another side to the development process, and this was the process that happened side by side with the customer outside the cluster. This means that the total development process could be divided in two parts; the bigger one happening within the cluster and the smaller one (inputs and needs) are happening mostly outside the cluster. Within the cluster, the most important part of the collaboration between the members happened within the free creative zones, which played an important role in the innovation process within the cluster. The zones were probably the strongest element of the total development concept. At the same time, the whole construction of free creative zones made it difficult for the members to know how to act within the zones. These problems were probably connected to the fact that the cluster was at the time of this study, unstructured with informal procedures. With more formal procedures, every member would know more how to act within the zones and what is expected of them. As it looked now, the “rules” were not clear enough, and this created certain strains on the collaboration between members. A too organized and formal structure, may however limit the creativity and innovation within the zones. The members have to find a balance between informal and formal procedures.

5.3.4 Design and creation of interactive versions

The offer regarding the digital shared workspace that was accepted in the first demo project was based on the technology Sharepoint from Microsoft, used by the member Samarbetsteknik, as explained in chapter three. Also as already explained; both of the demo projects were projects with the purpose to sell the services a digital shared workspace and a digital billboard, and that the first demo project had lasted since the end of 2005, and the second had only just started. By the time of this study, the member Samarbetsteknik was creating a specification regarding the demo project one, but this specification had not yet been presented to the customer. Instead of a detailed specification, the Sharepoint technology from Microsoft that the accepted offer was based upon was used in the demo project one as a starting-point. (E. Mases, personal communication, May 12, 2006). In a project it can be a good idea to create some sort of customer specification including what to develop and when different phases in a project shall occur. Further a customer specification is important in order to define the main usability and user experience goals. The content in such a specification may vary depending on the involved persons and the type of project. However the importance of such a specification cannot be denied. By creating a specification and presenting it to everyone involved earlier in the project, many misunderstandings and misinterpretations could have been avoided in the demo project one. A specification should be updated during the development process.

In excess of the specification, there are methods within the HCI field, that can be used in order to explore the design space and evaluate the design either together with users or not. In a user centered process the users are involved, and in the case of the two demo projects, the users from the hospital were very much involved providing feed-back regarding the alternative designs. In a general project like the two demo projects, the development process within Mobile Arena is activity driven, which means that the customer is informed of all the methods in advance before they

are used in a project. In the development process in the two demo projects, the members used the methods; *brainstorming*, *sketches*, *prototypes* and *user cases*, so as to capture the specific needs and demands of the customer that had not already been identified during the initial meetings discussed earlier. The use of these methods, allowed the members Samarbetsteknik and Penbook Sweden AB, to develop the services further and if needed, alter them accordingly to the response of the representatives. They also created alternative designs of the interface of the shared digital workspace, with the purpose of getting the users opinions on what they wanted/needed. (E. Mases, personal communication, May 12, 2006).

During observations of the two meetings with the representatives from the hospital, the member Samarbetsteknik, used only sketches for explanation purposes and to show the current design of the service. The sketches were in neither demo project drawn in advance; instead the member used either the white board in the room or drew a quick picture on a piece of paper. The reaction from the representatives varied. Some persons reacted by asking questions about the meaning of certain squares and lines, and other just pointed out what they liked or did not like. Many of the questions were about the interface and the terminology used on the links and buttons for example. An alternative way that would perhaps limited these kinds of questions, are guidelines, as explained in chapter four. Within the two demo projects the member/s had studied the organization and the way of work, but there were still questions about things like terminology as it seemed. One reason for this could have been that the material collected at previous meetings had not been written down and agreed upon by all parts. This kind of delay could have been prevented by creating a guideline in which terminology used at the hospital are to be specified, as well as a function analysis in which what the service should do is expressed. When designing services/products it is important to speak and use the intended user's language since they are the ones that will use the service in the end. As an interaction designer, you often work in between the programmer and the user as a form of communication link. In that case it is important to be able to translate the user's words and needs by using various HCI methods, as to design a service that will function as hoped in the intended environment. It is also of importance that the users requests are doable for the programmer/designer and in that sense the interaction designer also function as an interpreter between the users and the programmer. HCI methods can help moving the design forward instead of circulating around similar issues again and again.

Since demo project one had lasted longer time than demo project two, there were certain events that had happened in the first project that had not still happened in the second. Those events were *workshops* in which the representatives from the hospital was educated and trained in using the service with the intention of later on be able to illustrate the service to their co-workers. These workshops were another way to get important feed-back from the users and to further develop the design of the services. (E. Mases, personal communication, May 12, 2006).

5.3.5 Evaluation

Last in the development cycle of Interaction Design is the evaluation phase of the service/product. The members Penbook Sweden AB and Samarbetsteknik evaluated the service design frequently during the projects in the customer's natural environment at the hospital during meetings or workshops. Throughout these evaluations the representatives frequently got the opportunity to test and evaluate the service design and functionality and give back feed-back. (E. Mases, personal communication, May 12, 2006). For the duration of the observed meeting in demo project one, the member Samarbetsteknik took a somewhat passive role and allowed the representatives to speak freely and discuss together with the Mobile Arena member/s but mostly with each other about technical details of the service, how it should be implemented and pre-

sented to the final users and when.

Besides the prototypes, documents were used in order to function as a foundation for further discussions. During the meetings, the representatives in both projects were shown sketches of the suggested final service and they were given the opportunity to give feedback on headlines, structure functionality etcetera. During the observed meeting of demo project number one, the digital shared workspace, the feedback findings that the interface design had to be redesigned to some extent since the image that the member had of the service did not match the image of all the representatives. Design considerations must pay attention to individual differences, support social and organizational structures, design for reliability and safety (Sneiderman & Plaisant, 2005). Therefore the users act as resources describing their work duties, needs, hopes etcetera. This cycle is not fixed and the amount of iterations depends on among other things; what goals are decided that the service should perform; if there are goals decided; the available resources as time, money etcetera.

The development cycle consisting of identifying needs, design, creates interactive products and finally evaluation just described, can in some projects consist of more than a single iteration. How much iteration needed often depends on the customer and when the customer is satisfied with the service/product. In other cases the amount of iterations is determined by the available resources within a project or if the specification includes measurable goals that have been achieved. However it is rare or almost impossible to get the design right and according to the customers needs in the first trial, most often a design cycle iterate more than once. When asking the member Samarbetsteknik the quantity of iterations within a typical development process since the two demo projects had not finished, they could not give the investigators a specific quantity. The amount of iterations depended on the type of project.

5.4 Future possibilities for the development process of Mobile Arena

Combining the mobility with a business practice can change the processes related to the way the business is conducted and re-organize the roles of actors in a new value network. It is important for a company developing services to identify the target business network and distribution channels in an early phase of development, because networks and distribution are likely to have impact on design decisions. Because the implications of mobile services in business processes are difficult to anticipate, mature technologies and fast, iterative processes should be used for implementing mobile business services. Joining forces in R&D and process development between different actors is considered as one alternative of gaining competitive advantage. One factor pushing towards new mobile business services is the need for mediating connections to or from existing corporate IT systems to mobile terminals. (Alahuhta et al, 2005.)

The cooperation and using HCI design methods in the innovation process is the key factor also in identifying possibilities for more advantageous mobile service design and development processes. The system development approach defines interaction design as planning navigation, representations and the structures of information within user interfaces (Gulliksen and Göransson, 2002). Designing of interface is a platform for the interaction design and therefore important part of the mobile service development. Gulliksen and Göransson state that traditionally HCI is an area that investigates how humans interact with computers, mobile phones, palm pilots and other interactive systems. The aim of interaction design is to improve the interaction with the

help from special techniques or methods during the development process. (Gulliksen and Göransson, 2002). According to Kolmodin and Pelli the design can as a one tool function as a bridge between finance, technology and styling. Design offers a way of meeting the needs of customers in the production process and could be one way of gaining competitive advantages. (Kolmodin and Pelli, 2005.) In order to develop high quality systems, the final user should be involved within the development process in some way and the developer have to analyse the context in which the system is to be used after launching (Gulliksen and Göransson, 2002).

In the observed development process there were certain methods and documents that could have been used in order to avoid certain misunderstandings and misinterpretations. As for an example, in meetings with a customer in the future, the members can use more detailed sketches, guidelines including terminology, a customer specification presented to relevant persons involved in the project that would be updated continuously and design guidelines just to mention a few methods. The choice of methods of course depends on the available resources and knowledge about the methods, but they can be or perhaps should be reflected upon in future projects, as to hopefully save both time and money.

6 Discussions

The case study in comparison to the theory and the views of the cluster expert indicated clearly the importance of some findings over the other. The present competitive advantage of the Mobile Arena Cluster is based on growing cooperation, advantageous location and a vast knowledge of the local market, and the specialisation on developing mobile services to the health sector. The mobile service business is a growing branch of telecommunications and is likely to meet the growing synchronizing and efficiency needs of the health care. The location of the Mobile Arena Cluster is excellent what comes to the Nordic and other European markets. They have possibility to attract new company members as well as profit from the factor conditions and developed infrastructure of both Sweden and Denmark. In this chapter the investigators aim to discuss the results of the study and the chapter also serve as an introduction to the chapter 7 that lists the conclusions of this study.

6.1. The free creative zones

The interviewed members of the Mobile Arena were overall positive towards the cluster and what the membership could offer. As the last chapter revealed, the advantages weighed up the disadvantages even though there was a lot still to work on, as for example the informal organization. One of the big advantages of Mobile Arena is the cluster members cooperating within free creative zones, in which they share each others knowledge and resources. Being a member of a cluster like Mobile Arena can be beneficial for both small as well as larger companies in many ways. For example, small members benefit by being part of a larger network and being able to offer their services to a larger customer segment, and larger companies with quite structured closed routines benefits by being able to discuss ideas and innovations outside the walls of the company. Additionally, the unstructured organisation seemed to be the largest concern of the cluster members, and another concern was that not all the members invested equal amount of time and effort within the cluster. Nevertheless the members were very much aware of this fact and were prepared to work for creating a more structured organisation.

6.2. The location and infrastructure

The individual members of Mobile Arena came from Sweden, Denmark and the UK and contributed to the cluster with their various specializations within telecommunication as described in chapter three. According to Sörvik, clusters in the Öresund area, in Sweden and Denmark, profit from well-developed infrastructure and availability of two markets. From both markets they can approach the factor inputs and markets for promoting their products and services. Positive about

the current situation of the Mobile Arena Cluster is that is surrounded by big and successful companies. Mobile Arena gains advantage due to the close location to channels such as Sony Ericsson in Sweden in South of Sweden, and many other large firms in Copenhagen. For example many multinational companies have the headquarters in Copenhagen. In addition to this the Mobile Arena already has advanced and demanding customers like Region Skåne. (Jens Sörvik, 2006.)

In addition to the advantages of local developed infrastructure, according to Sörvik, the Mobile Arena has access to the venture capital like Malmö Hus Invest and Volito. The resources can gain strength of the closeness to University students and research. These directions provide labour and new innovative input in the form of knowledge, students from Malmö, Lund and Copenhagen. The mobile Arena Cluster is provided with a good infrastructure, for travelling meeting customers, for example Kastrup in between Malmö and Copenhagen is very central airport in Europe and has routes to all over the world. The benefits of excellent wireless networks and broadband connections can not be underestimated. (Sörvik, 2006.)

6.3. The new mix of competences

The Mobile Arena Cluster faces some risks, like getting used to too convenient cooperation with the same partners and loosing out on innovativeness that threaten the success of the cluster (Sörvik, 2006). For example this risk could be controlled easier, if the Mobile Arena Cluster had a hired leader. This leader would be in charge of making sure that the cluster gets organized to the appropriate extent. Keeping up the ideal competition and cooperation in the cluster and making sure that the necessary competences are covered in the projects could be on his responsibility. It would be a good idea to develop a competence matrix that lists which kind of knowledge exists in each cluster member (Sörvik, 2006). In addition to the controlling competences, the leader could have main responsibility for example selecting the ways to measure success of the cluster. The measurements could include number of new clients, increased incomes, increased revenues, growth of firms, number of innovations or number of new products (Sörvik, 2006).

This study indicated occasional problems of cluster members in communicating with the representatives of the customer. Communicational problems affected the way resources were handled, and the consequence can be inefficiency and harm to customer relations. Such problems are evident in any design project and can be turned on the positive path by a thoughtful Interaction Designer (Löwgren and Stolterman, 2005). Things like lack of common terminology, unclear ways to represent ideas and uncertainty in using the customer and user potential to the full extend implies that HCI design tools - and Interaction Designer competences that know how to use these tools - could be useful for Mobile Arena Cluster.

6.4. Promoting the cluster and the innovation with help of the new competences

The Mobile Arena Cluster members appeared to acknowledge the importance of constant marketing of their functions. The Mobile Arena Members should market and promote their location based strengths also internationally (Sörvik, 2006). The need for more organized marketing can

be considered another reason for hiring a cluster leader. The potential cluster leader would need skills in marketing and sales and could be a useful public figure representing equally the mutual interests of cluster members. As a main figure of the Mobile Arena Cluster the leader would make an excellent promoter and collaborator in different kinds of occasions. The cluster leader could try to find new business opportunities for the firms, and also to develop joint packages to offer to potential clients (Sörvik, 2006).

The Mobile Arena Cluster would profit from more active collaboration with the universities and big firms and parties that function for the development of the region (Sörvik, 2006). The regional cooperation for international visibility could provide them with stronger network and new opportunities. For example Business Arena Imaging is a cooperation project between Teknopol, Region Skåne, VINNOVA, Länsarbetsnämnden, Trygghetsrådet, the incubators in MINC, Malmö och Ideon Innovation in Lund – that promotes the growth in Skåne (Sörvik, 2006). Identifying cooperative opportunities, initiating the seminars and theme evenings for attracting new cluster members, and initiating collaborative innovation would definitely be tasks of the cluster leader. In the operative level an Interaction Designer could add to the collaborative innovation during the different phases of a design and development processes. Guiding in the effective brainstorming, developing design processes, introducing new methods and collaborating techniques are examples of the contributions the Interaction designer could offer.

6.5 Evaluating the study and the findings

In addition to the findings one of the contributions of this study is its approach that first explored the markets and demand surrounding the cluster and then dived deeper into their activities. The approach had both positive and negative consequences. The study gives a clear picture of a functioning cluster and the actions of its members during a service development process. The requirement of in-depth information in this case study was not completely reached due to selection of a wide approach that took a journey from a wide picture of mobile cluster to specific design decisions at the client's premises. Some important connections between the actors on the market were therefore left consciously outside the analysis. The selection of subject was interactive. Cooperation with a cluster member before creating the research design affected the selection of subject and adds to the relevancy of the subject. The subject of this study is interesting from several points of views. It is multidimensional, and concentrates on studying rich context from a relevant perspective. Collecting the evidence could have been utilizing more alternative perspectives: the study was not enough challenged theoretically or practically due to time restrictions. In spite of several challenges a wide picture of a cluster and actors around clusters was gained by this study.

6.6 Suggestions for the future research

The combination of Cluster theory and Activity theory appeared to be functional and when used in a simple way like in this study, the theories were relatively easy to adjust and apply. The investigators found the approach interesting and argue that more investigation utilizing this perspective in co-operation with clusters or companies would be useful. The future investigators are ad-

vised to prepare more time for acquiring more in depth analysis, or dividing the research subject into smaller pieces. Investigating the design processes of the companies especially in the innovating fields of industries would be an interesting future target of studies. The networks of clusters proved to be a versatile and interesting target for research and would also offer several kinds of possibilities for producing new information from different points of views. For example taking the co-operative activities and occasions into closer exploration could produce new ways of utilizing expertise of an interaction designer in a wider scale. According to Yin a good case study is complete and offers an understandable description of the phenomena and its context; it demonstrates that the relevant evidence is collected (Yin, 1994). Within its limits the study succeeded in giving a complete picture and collecting the relevant evidence.

7 Conclusions

Before concluding the study it is necessary to look into the complete case study and the study research once more. Interesting findings about the Mobile Arena cluster, its networks and mobile service development process were made and some ideas for fulfilling the goals of this study were suggested in the previous chapter. The findings were also reflected towards the expert's opinions, theories and the literature. The purpose of this case study was to discover the socio-technical contexts of mobile service development in the Mobile Arena cluster by answering the research question; *how are mobile services developed in the socio-technical contexts of the Mobile Arena -cluster?* The investigators chose to study the Mobile Arena cluster from a human-computer interaction (HCI) design point of view. Besides the purpose the investigators had the following goals with this study; to find out how Mobile Arena members interacted around mobile service development within the cluster, how a cluster may function regarding mobile service development in general and finally to identify possibilities for a more advantageous Mobile Arena cluster and mobile service development process within the cluster.

The Mobile Arena functions in the wellness and healthcare sector and attempt to provide their customers with advantages of integration through SOA. The findings of the study indicated that many Mobile Arena cluster members considered the cluster as an ideal mobile service development environment. Due to the bigger innovation base and flexibility achieved by the availability of different kinds of competences, the Mobile Arena members were capable of offering wider product and service range to the wider groups of customers – even big clients or their providers. In the case of Mobile Arena, identifying possibilities and ways for more advantageous co-operational clusters could include actions suggested by Sörvik (2006):

- Encourage several kind of increased co-operation for generating new innovations and attracting new members.
- To measure the success of the cluster by listing new clients, increased incomes and revenues, growth and amount of innovations or products.
- Promote future success and utilize several surrounding possibilities.
- Hire a leader for Mobile Arena.
- Develop a competence matrix. (Sörvik, 2006.)

In spite of its young age the Mobile Arena cluster appears to gain advantage of its competitive, but completing cooperation. The members have created ways to compete, but at the same time be cooperative in the “free creative zones” that lead their innovation activity, education and utilizing the different competences within a cluster. The atmosphere during the design development process gives indication of dedication and professional enthusiasm. The user-centered design process with iterations and prototyping appeared to be natural part of the work. The investigators concluded that a more versatile and systematic use of HCI design methods could benefit the Mo-

Mobile Arena Cluster and their customers even more. The following suggestions are given regarding the observed development process within the cluster:

- Create more documentation in order to avoid certain misinterpretations and misunderstandings, i.e. detailed sketches, guidelines including terminology and earlier customer specifications that are updated continually. Utilize the measurable usability goals.
- Put up design process guidelines, i.e. how the individual members with different kinds of backgrounds should collect, present and work with information in a project and with each other.
- Attract competences from field of HCI design in order to add to the innovation power of an already multidisciplinary Mobile Arena Cluster.

Also the mentioned new kinds of cooperation projects and happenings around innovation and service development could bring more force and creativity to the service development processes. In order to succeed in the cooperative projects the resources must be considered – as part of them the strengthened mix of competences.

Appendix 1 - Description of the contents of the Case Study Protocol used in this study

Case study protocol

1. Purpose
2. Clusters and HCI design process
3. The main objectives

I Methods

- 1.1 Initial scheduling of field visit
- 1.2 The co-operation plan
- 1.3 Documents and materials needed
2. Sources of information
 - 2.1. Literature
 - 2.2. Documents
 - 2.3. Archival records
 - 2.4. Interviews and direct observation
 - 2.5. Multiple sources for verifying the results
3. Training the case study team
 - 3.1 Purpose of training.
 - 3.2 Topics of training

II Case Study Protocol and Question

1. The research questions
2. The purpose of a pilot study
3. The questions (in Swedish) for Cluster Experts
4. The research guide (in Swedish) for the companies within the cluster
 - 4.1 Interview guide (for the informants in Swedish)
 - 4.2 Observation of the design process (in swedish)

III Analysis Plan and Case Study Report

1. Pilot study
 - 1.1 The expert questions
 - 1.2 The interview about clusters
 - 1.3 The observation and interviews about the m-service design process
2. Mobile service cluster and networking
 - 2.1 Descriptive information
 - 2.2 Explanatory information
 - 2.3 Noting the development possibilities
3. Design process
 - 3.1 Descriptive information
 - 3.2 Explanatory information
 - 3.3 Noting the development possibilities
4. Case study report
 - 4.1 Target reader
 - 4.2 Reporting approach and criteria
 - 4.3 Preliminary structure

Appendix 2 - Summary of the members of Mobile Arena

Company Logo	No of Employees	Summary
	3 plus project employees	<i>PenBook Sweden AB</i> is a company in Malmö, Sweden, that develops solutions for electronic data capture and knowledge sharing as well as combined solutions that include mobile phones, handheld computers, tablet PC units and built-in systems. CEO co-founder of Mobile Arena. (www.penbook.net).
	1	Krister Hilmersson works as a hardware consulting firm. CEO co-founder of Mobile Arena (www.hilmersson.nu)
Netonik Communcations	1	Netonik Communcations is a company in Hoellviken, Sweden, and operates as a hardware consulting firm. Owner co-founder of Mobile Arena.
	52	<i>Milcom</i> is a company in Aarhus, Denmark, that works with data capture, SMS solutions, logistics, e-commerce, and function as a distributor of fixed phones, mobile phones and accessories, DECT-telephones and other related communication products (www.milcom.dk).
	7	<i>The Cloud</i> is a British WiFi network operator, and is a multi-user provider platform that offers WLAN coverage in the UK, Germany and Nordic region. They facilitate other providers, mobile operators and cable companies so they can offer customers fully branded WLAN. (www.cloud.com)
SpeechCom	1	<i>Speechcom</i> is a company in Gothenburg, Sweden, that develops user friendly systems for dictation, voice synthesis, and as well as various headsets and speech dictation devices (www.speechcom.se).
	10	<i>Optimon</i> is a company in Stockholm, Sweden, and is a leading global market research and consulting firm. The company offers knowledge about a wide range of market research within pulp/paper, data/telecom, medical/healthcare and industry/service (www.optimon.dk).
	1	<i>Samarbetsteknik</i> is a company in Malmö, Sweden, that design digital shared workspaces with focus on communication and information sharing. The company also provide tools and methods that support e-learning (www.samarbetsteknik.se).
BLOCKMASTER™		<i>Blockmaster</i> is an Information Security company in Lund, Sweden, that tailor complex technologies to fit organisations specific needs and everyday operations by protecting brands, safeguard information, and increase bottom-line profits. (www.blockmaster.se)
	1	Polypol is a company in Karlskrona, Sweden, that work with Strategic business development including: ICT management, e-society, CityNet development, e-business, broadband solutions and e-government. The company was awarded broadband entrepreneur of the year, 2006 (www.polypol.se)

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 densitet	10-19	<i>Densitet</i> is a company in Karlskrona, Sweden, that specializes in mobile solutions and wireless technologies. Their products focus on mobile data storage, mobile security, mobile databases, and combinations of tailor-made solutions (www.densitet.se).
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Appendix 3 - The cluster expert questions



University of Lund
Department of Economics

The Socio-Technical Environment of the Mobile Arena -cluster

Case Study of service development process of Mobile Arena

Cluster expert questions, May 29th 2006

Supervisor:

Erik Wallin

Students:

Maria Fröderberg, 810511

Master student in interaction design

Department of Informatics, University of Lund, Sweden

Minna Tanskanen, 690104

Master student in interaction design

Department of Informatics, University of Lund, Sweden

1. Your expert opinion

The other attachment you received is a thesis draft of a Mobile Arena –cluster and this paper includes 10 questions concerning the cluster. We are very grateful, if you can answer as many questions as possible. The form of answers is free and based on your own experience as a cluster expert. Please write your questions on this word document and save. Send the filled in and saved file back to minna.tanskanen@student.lund.se. Thank you.

2. Purpose

The purpose of this case study is to discover socio-technical contexts of mobile service (m-service) development of a Mobile Arena -cluster in Malmö, Sweden. The approach is based on human-computer interaction (HCI) related design process point of view, which is generally defined being user-centred, iterative and multidisciplinary. The study is divided into two parts: the first consisting of studying the cluster with its networks and interest groups, and the second

of two different m-service development processes. The aim is to find out how different interest groups interact around service development within a cluster and identify possibilities for more advantageous co-operational clusters and service development processes.

The central research question:

- How are mobile services developed in the socio-technical contexts of the Mobile Arena - cluster?

3 The questions

1. May we use your answers in our thesis and mention your name as a specialist in the same context? If yes, please write your name, profession and position in the organisation.

Answer: - Yes, but I would like to read and approve what is attributed to me and in which context it is, prior to publishing it. Jens Sörvik, Researcher, Research Policy Institute, Lund University.

2. What came to your mind after reading the story? What is your first impression about the Mobile Arena mobile service cluster?

Answer: - Very interesting. When discussing clusters, one can always discuss whether it is a cluster as the number and size of firms is limited. However I would probably agree that it is a cluster. Is it open? Can it be kept intact to include more members? Is there anyone who dominates it? Or can everyone equally affect the development? 5.2.3 are there no consultants that are hired, localized and with special knowledge in the region, or do they do everything within the network.

3. Considering companies that create mobile services, to your opinion, what could be the greatest advantages for companies that are part of a mobile cluster in Malmö?

Answer: - Closeness to channels such as Ericsson, Sony Ericsson, and other large firms in Copenhagen, advanced and demanding customers like Region Skåne. Operator headquarters in Copenhagen. Vodaphone development office in Kalrskrona, not too far away. Professional suppliers like Teleca? Venture capital like Malmöhus Invest and Volito. Closeness to University students and research providing labour and new innovative input in the form of knowledge, students from Malmö, Lund and Copenhagen. Good infrastructure, for travelling meeting customers, i.e. Kastrup, but also good wireless networks and broadband.

4. Advantages for companies in general?

Answer: - Infrastructure, and two markets, Sweden and Denmark, two markets for setting of products and services, but also two markets with factor inputs.

5. What would be the best ways of measuring the success of a Mobile Service Cluster?

Answer: - The number of new clients, increased incomes, increased revenues, growth of firms, number of innovations/new products.

6. What kinds of disadvantages can the clustering cause for companies that are part of a Mobile Service Cluster in Malmö?

Answer: - Maybe they can become tied to using specific partners, the cluster becomes closed, losing out on innovativeness.

7. Why?

Answer: - There are a limited number of firms, which tie them hard together.

8. What kind of development in the markets of Öresund region could cause advantages for companies that are part of a Mobile Service Cluster in Malmö?

Answer: - The location of offices for International firms providing mobile services. Or location of headquarter of operator, like Orange. But also offices such as research office for SAP, or firms providing IT services for public sector.

9. How can the companies themselves affect on the success of Mobile Service Cluster in Malmö?

Answer: - Market themselves and promote their strengths at international conferences, Collaborate with IT öresund and position Skåne in order to promote this strength that exists in the region internationally. In order to try to acquire new customers, but also to try to attract the location of large firms that can function as customers.

Collaborate with universities in designing courses that promote students to study the subject and start new firms within the area also to build a strong regional knowledge base in the area.

Maybe involve and tie in some of the large firms that exist in the region into the cluster.

To attract participant in the cluster, theme nights could be arranged with seminars and networking. Where different stakeholders are invited. Such as developers from large firms, purchasers from public sector and large firms, Academics, etc.

In the area of vision and imaging, Teknopol and region skåne and Länsarbetsnämnden ahs set up something called Business Arena Imaging, where they have set-up joint business development projects. Where new ideas, have been combined, with management resources and labour for a set period of time, giving an opportunity to develop a business idea, which can benefit different firms. This could be a tool to be explore and managed by the cluster in order to find financing and developing new ideas around mobile services.

Maybe a Cluster leader could be hired, either from public funding or from resources from each firm. This cluster leader could be assigned to try to find new business opportunities for the firms, and also to develop joint packages to offer to potential clients.

Develop a competence matrix, that codifies which kind of knowledge exist in each firm, Which can be accessed by the other members, increasing knowledge about each other.

10. Any other comments about clusters, research approach, the case or questions?

Answer: - Interesting mix, and good thing to develop further how clusters can support the innovation and design process. Will need to read report in more depth, when you are done.

Thank you for your participation!

Appendix 4 – The e-survey questionnaire

1. Företagets namn?

2. Din roll i företaget?

Företags strategi och konkurrens

3. Vilken positioneringsstrategi har ert företag ?

- Kostnads ledande (lägsta pris)
- Differentiering (särskiljer produkten/tjänsten)
- Fokus (på ett fåtal segment)
- Annat

4. På vilka sätt differentierar ert företag era produkter/tjänster från era konkurrenter?
Genom:

- Produkt differentiering
- Service differentiering
- Personal differentiering
- Image differentiering (ett speciellt märke)
- Annat

5. Vilka är era 3 största konkurrenter?

6. Kan ni nämna 3 kvalitéer hos ert företag som ökar er konkurrenskraft på marknaden för mobila tjänster i jämförelse med era konkurrenter?

7. Vilka ser ni kan komma att bli era konkurrenter i framtiden? Inom vilken bransch, stora/små företag, typ av företagsformationer etc?

8. Hur mycket på en skala mellan 1 och 3 påverkar era konkurrenter ert företags produkter/tjänster gällande:
(1=lite, 3=mycket)

a.Kvalité och service?

b.Att utveckla nya produkter och era utvecklingsprocesser?

9. På vilket sätt kan er delaktighet i Mobile Arena öka er konkurrenskraftighet?

10. På vilket/a sätt kan Mobile Arena vara till hjälp om/när ni ska konkurrera globalt?

Factor conditions

Mänskliga resurser

11. Hur många är ni som arbetar inom företaget idag?

Kompetens resurser

12. Vilka är de avgörande kunskaperna/kompetenserna för att lyckas i er verksamhet?

**13. På en skala mellan 1 och 3, hur uppdaterade är ert företag gällande:
(1=lite, 3=mycket)**

Forskning ?

Ny teknik?

Branschförändringar?

14. Vilken kompetens saknas mest i ert företag gällande utveckling av mobila tjänster?

15. Är ert företag involverat i någon form av universitetsforskning?

Ja

Nej

a Med vilket universitet?

b. Vad är syftet med samarbetet?

Finansiella resurser

16. Hur finansieras typiskt era projekt och vem finansierar dem?

Fysiska resurser

17. Vilka fysiska/materiella resurser använder/behöver ni för att utveckla era produkter/tjänster?

Ex Typ, kvalitet, tillgänglighet och kostnad etc?

18. Vilka är era leverantörer av dessa fysiska/materiella resurser?

19. Vilka ytterligare fysiska/materiella resurser behöver ni för att förbättra/utveckla era tjänster/produkter?

Relaterade och stödjande industrier

Affärsutveckling

20. Hur kom ni att bli en del av Mobile Arena? På vems initiativ etc?

21. Varför blev ni en del av Mobile Arena?

22. Vilken erfarenhet hade ni av Mobile Arena och dess aktörer innan ert företag blev delaktigt?

23. Inom vilken/a bransch/er fanns främst era kunder innan ni blev en del av Mobile Arena?

**24. Hur har uppdragen förändrats sedan ni blev en del av Mobile Arena?
Ex ökad efterfrågan, andra typer av kunder?**

25. Hur har era arbetsrutiner/samarbetsformer med andra företag och kunder förändrats sedan ni blev delaktiga i Mobile Arena?

Samarbete

**26. Vilka aktörer inom Mobile Arena är ert företag mest beroende av?
Ex vilka aktörer samarbetar ni mest med? (Flera alternativ kan väljas)**

- Milcom Digital Invention
- Densitet
- Penbook
- BlockMaster
- Samarbetsteknik
- Cloud
- Optimon
- SpeechCom
- Krister Hilmersson
- Polypol
- Netonik Communications
- Annan

27. I vilket syfte sker samarbetet, typiskt exempel?

28. Vilka fördelar/nackdelar och hot/möjligheter finns det med att VARA en del av Mobile Arena?

29. Vilka fördelar/nackdelar och hot/möjligheter finns det med att INTE VARA en del av Mobile Arena?

30. Vilka viktiga relationer och kontakter har ni med företag, organisationer, myndigheter etc i nationellt/internationellt utanför Mobile Arena?

Upplevda hot och möjligheter:

31. Vilka hot/möjligheter ser ni i framtiden för Mobile Arena?

Efterfrågan

32. Vilken/a är er/a kund målgrupp/er?

33. Är det kunder som nåtts via Mobile Arena?

- Ja
- Nej

34. Hur stort kundsegment har ni av den mobila tjänstemarkanden i Sverige?

35. Hur stort kundsegment har ni i den lokala regionen som ert företag befinner sig i?

**36. Vad efterfrågar kunder som är intresserade av mobila tjänster idag?
(Flera alternativ kan väljas)**

- Bättre räckvidd/mottagning
- Låga priser
- Bättre kvalité
- Mer och bättre information om den mobila tjänsten
- Bättre användarvänlighet generellt

Annat

37. Vad klagar kunder över gällande mobila tjänster idag? (Flera alternativ kan väljas)

- Räckvidd/Mottagning
- Pris
- Kvalité
- Information
- Användarvänlighet

Annat

38. Vilka trender kan ni förutspå gällande kunders framtida krav och behov av mobila tjänster?

Appendix 5 – Material used during observations

Frågeformulär

1. What - Vilken är tjänstens som ska utvecklas?
2. Who - Vilka är användarna?
3. Which - Vilka är arbetsuppgifterna?
4. Where - I vilken miljö ska tjänsten fungera?
5. When - När behövs tjänsten?
6. Why - Varför behövs tjänsten?

Generella frågor

1. Hur såg er inledande kontakt med kunden ut?
 - a. Ex på frågor etc?

 - b. Övriga rutiner?
2. Vilka förväntningar har man på er som leverantör av den mobila tjänsten?
3. Kan ni ge exempel på eventuella förväntningar hos kunden?
4. Kan ni ge exempel på eventuella förväntningar hos slutanvändarna?
5. Används all insamlad information i projektet för att designa tjänsten?
 - a. Ja - Hur?

 - b. Nej - Varför inte?

Användarfokuserad ansats

6 Är användarcentrerade designmetoder implementerade i utvecklingsprocessen av mobila tjänster?

a. Tidig fokus på användare? []

b. Sätts det upp mätbara mål som den färdiga tjänsten ska uppnå? []

c. Är utvecklingsprocessen iterativ? []

7 Hur många iterationer är planerade alternativt sker i en typisk utvecklingsprocess?

a. Syfte?

b. När är det bestämt att iterationerna ska vara tillräckliga? Uppsatta mål?

c. Vilka är involverade i de olika iterationsfaserna?
8. Vilken roll anser ni att metoder och tekniker gällande interaktions design spelar eller bör spela i era utvecklingsprocesser?

(metod - ett utstakat sätt att agera)
(teknik – En specifik form av utförande)

Design kontexten

9. Hur har ni reflekterat kring problemet när ni först blev introducerade inför design uppgiften?

a. Till hur stor del undersöker ni problemet i förhållande till den tid ni lägger på att hitta lösningar?

b. Använder ni olika metoder? Vilka metoder använder ni (Flera alternativ kan väljas)?

Skisser
Storyboards
Brainstorming
Annat.....

10. Genomfördes en verksamhetsanalys?
Innehåll?

11. Vad innehöll krav specifikationen?

a. Av vem gjordes den?

b. För vem?

c. Innehåll?

d. Självklara/uttalade krav?

e. Sätter ni upp effektkrav och användningsegenskaper?

f. Hur prioriteras (1=lite, 3=mycket):

1 2 3

Funktioner
Effektkrav
Målgrupper

12. Hur identifierades målgruppen/rna?

13. Är slutanvändarna delaktiga i utvecklingsprocessen?

a. Ja – Varför?

i Inom vilken/a fas(er)?

ii Hur?

d. Nej - Varför inte?

14. Hur medvetna är kunden/slut användarna om processens utveckling (1=lite, 3=mycket)?

1 2 3

15. Genomfördes en användbarhetsanalys? Innehåller den aspekter gällande (Flera alternativ kan väljas):

a. Hjälpfunktion?
b. Dokumentation?
c. Utbildning?
d. Rådgivning?
e. Annat.....

16. Med vilka metoder eller hur genomförs den funktionella analysen (Flera alternativ kan väljas)? Används

Analys av konkurrerande produkter
Marknadsundersökningar
Intervjuer med användare
Intervjuer med experter
Why-why-why
Fältstudier
Deltagande observationer
Ej deltagande observationer
Workshops
Annat.....

b. Syfte?

c. I vilka faser?

17. Hur skapas den mer detaljerade specifikationen (Flera alternativ kan väljas)?

Används scenarior
Gränssnittsritningar
Storyboards
Prototyper
Annat.....

18. Tar ni fram alternativa lösningar?

a. Syfte?

d. Upplevd nytta (1=lite, 3=mycket)?

1	2	3
{ }	{ }	{ }
{ }	{ }	{ }
{ }	{ }	{ }

19. Hur presenteras tjänsten för kunden/slutanvändarna under processen?

a. Vilka representationer använder ni (Flera alternativ kan väljas)?

Prototyper	{ }
Drafts	{ }
Skisser	{ }
Modeller	{ }
Annat.....	

b. Vilken form av prototyper (Flera alternativ kan väljas) ?

Pappers	{ }
Interaktiva	{ }
Annat.....	

c. Om endast en eller ingen alls, varför?

d. Hur anpassar ni dem efter målgruppen (Flera alternativ kan väljas)?

Språk	{ }
Mer bilder	{ }
Jargonger	{ }
Annat.....	

Utvärdering

20. Hur går det till när ni utvärderar era designförslag/prototyper gällande mobila tjänster?

a. Syftet med utvärderingarna?

b. Tillsammans med vem (Flera alternativ kan väljas)?

Slutanvändare	{ }
Experter	{ }
Annat.....	

c. När?

Från början och igenom hela projektet?	{ }
I utvalda faser?	{ }

I Vilka faser?.....

I slutet? []

d. Vart sker utvärderingarna?
Naturlig miljö { }
Labbmiljö { }
Annat.....

d. Vilket material använder ni i samband med utvärderingen (Flera alternativ kan väljas)?
Dokument { }
Kamera { }
Frågeformulär { }
Annat.....

Multikompetens - samarbete

21. Vilka företag/leverantörer är involverade när ni utvecklar mobila tjänster?

22. Vilken kompetens och tjänster/produkter bidrar de med till projektet?

23. Vilka kompetenser/personer är med och planerar den mobila tjänstens design (Flera alternativ kan väljas):

Kunden { }
Användare (de flesta) { }
Representativa anställda { }
Experter { }
Programmerare { }
Interaktionsdesigners { }
Användbarhetsexperter { }
Annat.....

b. Vilken status och professionell roll har de?

24. På vilken plats sker vanligtvis planeringen av projektet (Flera alternativ kan väljas)?

Hos kunden { }
Leverantören { }
Annat.....

References

- Ackerman, M. S. 2002. The intellectual challenge of CSCW: the gap between social requirements and technical feasibility. In J. M. Carroll, ed. *Human-Computer Interaction in the New Millennium*. Addison-Wesley, New York, USA.
- Alahuhta, P., Ahola, J., Hakala, H. 2005. Mobilizing business applications. *Technology review* 167/2005. Tekes, Helsinki.
- Andersson, T., Schwaag-Serger, S., Sörvik, J., Wise Hansson, E. 2004. *The Cluster Policies Whitebook*. IKED International Organisation for Knowledge Economy and Enterprise Development. Holmbergs, Malmö, Sweden.
- Bertelsen, O. W. Bødker, S. 2003. Activity Theory. In Carroll, J.M. (ed.). *HCI Models, Theories, and Frameworks: Toward an Interdisciplinary Science*. Morgan Kaufman Publishers.
- Bianchi, Chan, Holzbock, Hu, Jahn, Sheriff, Melazzi. 2003. Design and Validation of QoS Aware Mobile Internet Access Procedures for Heterogeneous Networks. *Mobile Networks and Applications* 8, 11–25.
- Callon, M. 1999. Actor-Network Theory – The Market Test. In J. Law, J. Hassard, ed. *Actor Network Theory and After*. Blackwell publishers, Oxford, UK.
- Carroll, J. M., Chin, G., Rosson, M. B., Neale, D. C. 2002. The development of cooperation: five years of participatory design in the virtual school. In J. M. Carroll, ed. *Human-Computer Interaction in the New Millennium*. Addison-Wesley, New York, USA.
- Cooper, A. 1999. *Inmates are running the asylum*. HW Sams, US.
- Creswell J. 1997. *Qualitative Inquiry and Research Design: Choosing among Five Traditions*. SAGE Publications, California, U.S.A.
- Grint, K. Case, P. and Willcocks, L. 1996. Business Process Reengineering Reappraised: The Politics and Technology of Forgetting. In: Orlikowski, W.J.; Walsham, G; Jones, M.R. and DeGross, J. I. ed. *Information Technology and Changes in Organizational Work* Chapman & Hall, London.
- Dutta, S., Lopez-Claros, A., Mia, I. 2006. Executive Summary. In *Global Information Technology Report 2005-2006*. Available from: http://www.weforum.org/pdf/Global_Competitiveness_Reports/Reports/GITR_2004_2005/Executive_Summary.pdf [Accessed 2006-04-11].
- Dutta, S., Lopez-Claros, A., Mia, I. 2006. The Networked Readiness Index. In *Global Information Technology Report 2005-2006*. Available from:

http://www.weforum.org/pdf/Global_Competitiveness_Reports/Reports/gitr_2006/rankings.pdf
[Accessed 2006-04-11].

Dutta, S., Lopez-Claros, A. 2005. The Networked Readiness Index. In Global Information Technology Report 2005-2006. Available from:
http://www.weforum.org/pdf/Global_Competitiveness_Reports/Reports/GITR_2004_2005/Networked_Readiness_Index_Rankings.pdf [Accessed 2006-04-11].

Engeström, Y. 1987. Learning by expanding: An activity-theoretical approach to developmental research. Orienta-Konsultit, Helsinki.

Engeström, Y. 2005. Developmental work research: Expanding Activity Theory in practice. Berlin: Lehmanns Media.

Hasu, M., Engeström, Y. 2000. Measurement in Action: An Activity-Theoretical Perspective on Producer-User Interaction. International Journal of Human Computer Studies, 53, 61-89.

Hanseth, O., Aanestad, M. & Berg, M. 2004. Guest editors' introduction: Actor-network theory and information systems. What's so special? Information Technology & People. June 2004, Vol 17, Issue 2, pp.116 – 123. Emerald Group Publishing Limited.

Hirschfeld S., Schmidt, G. 2005. Globalization of R&D. Tekes, Technology Review 184/2005. Painotalo Miktor, Helsinki, Finland

Jens Sörvik, e-mail 30.6. 2006. Researcher, Research Policy Institute, Lund University

Kanerva, J., Haapasalo, H. (2005). Mobiiliteknologia rakennus- ja kiinteistöalalla. Technology review 187/2005, Tekes, Helsinki.

Karvonen, J., Warsta, J. 2004. Proceedings of the 3rd international conference on Mobile and ubiquitous multimedia MUM '04 Publisher: ACM Press.

Kolari, P. 2003. Applying Activity Theory in developing a framework for understanding and guiding systems development in product development context. 8th European Conference of Computer-Supported Cooperative Work Helsinki, Finland, 14th September 2003. Available from: <http://www.uku.fi/tike/actad/ecscw2003-at/> [Accessed 2006-05-06]

Kolmodin, A., Pelli, A. 2005. Design for innovation and growth – a promising competitive concept in the future? ITPS, Swedish Institute For Growth Policy Studies. Stockholm, Sweden.

ISO, 2006. Standards [Accessed 2006-05-17]

Lamont, J. 2006. Service-oriented architecture: a way of life. KM World; Feb; 15, 2; ABI/INFORM Global, pg. 20.

Latour, B. 1987. Science in Action: How to Follow Scientists and Engineers through Society. Harvard University Press, Cambridge, Massachusetts, U.S.A..

Lauche, K. 2003. Mediating between theory and practice: Activity Theory concepts & tools for system design. 8th European Conference of Computer-Supported Cooperative Work Helsinki,

Finland, 14th September 2003. Available from: <http://www.uku.fi/tike/actad/ecscw2003-at/> [Accessed 2006-05-06]

Leppävuori, I. 2002. Analysis of the Finnish Mobile Cluster - Any Potential in Mobile Services? Ministry of Transport and Communications, Finland. Available from: <http://www.mintc.fi/www/sivut/dokumentit/julkaisu/julkaisusarja/2002/a282002.pdf> [Accessed 2006-04-12].

Lutz, E. M., Werner, J. A. 2000. Satellite Systems for Personal and Broadband Communications, Springer-Verlag, Berlin.

Löwgren, J., Stolterman, E. 1999. Design methodology and Design Practice. Interactions. Vol. 6, Issue 1.

Löwgren, J., Stolterman, E. 2005. Thoughtful Interaction Design – a design perspective on information technology. The MIT Press, Cambridge, Massachusetts, London, England.

Maxwell J. A. 2005. Qualitative Research Design: An Interactive Approach. Sage Publications.

Maxwell, K. 2002. Maturation of HCI: Moving beyond Usability toward Holistic Interaction. In J. M. Carroll, ed. Human-Computer Interaction in the New Millennium. Addison-Wesley, New York, USA.

Miles, M. B., Huberman, A. M. 1994. Qualitative Data Analysis. Sage Publications.

Monteiro, E. 1998. Actor-Network Theory and Information Infrastructure. Available from: <http://www.idi.ntnu.no/~ericm/ant.FINAL.htm> [Accessed 2006-04-12].

Mullet, K., Sano, D. 1995. Designing visual interfaces: Communication oriented techniques. Englewood Cliffs, NJ: Prentice Hall.

Mwanza, D. 2002. Towards an Activity-Oriented Design Method for HCI research and practice. Knowledge Media Institute, The Open University, United Kingdom. Available from: <http://iet.open.ac.uk/pp/d.mwanza/phd.htm> [Accessed 2006-05-06].

Olofsson, K. (2006- 04-28) Till din tjänst – SOA i steg steg. Special issue, Computer Sweden, CS, IDG Communications.

Orlikowski, W. J., Robey, D. 1991. Information Technology and the Structuring of Organizations. Information systems research, 2(2): pp.143-169.

Nielsen, J. 2001. Ten usability heuristics. Available from: www.useit.com/papers/heuristics.are.the.solution. Cambridge, Massachusetts, MIT Press.

Norman, D. A. 1998. The invisible computer: why good products can fail, the personal computer is so complex, and information appliances.

McKean, K. 2005. Service-Oriented Architecture. InfoWorld; Jan 24, 27, 4; ABI/INFORM Global pg. 6

- Porter, M.E. 1990. *The Competitive Advantage of Nations*. New York (NY), The Free Press, U.S.A..
- Porter, M. E. 1998. *The Competitive Advantage of Nations: With a New Introduction*. Free Press, U.S.A..
- Preece, J., Rogers, Y., Sharp, H., Benyon, D., Holland, S., Carey, T. 1994. *Human-computer interaction*. Addison Wesley, New York.
- Preece, J., Rogers, Y., Sharp, H. 2002. *Interaction Design: beyond human – computer interaction*. John Wiley & Sons, New York.
- Rubin, J. 1994. *Handbook of usability testing: how to plan, design, and conduct effective tests*. Wiley, New York.
- Saddler, H. (2001). *Understanding the Design representations*. Interactions, ACM.
- Scottish Enterprise 2006. *Mobile & wireless technologies - a business case for Scottish SMEs-report*. Prepared by Targeting Innovation Limited. Available from: http://webserv2.tekes.fi/opencms/opencms/OhjelmaPortaali/Valmisteilla/VAMOS/en/Dokumenttiarkisto/Viestinta_ja_aktivointi/Julkaisut/Mobile_Wireless_app.pdf [Accessed 2006-04-12].
- Schneiderman, B. 2002. *Creating creativity: User Interfaces for Supporting Innovation*. In J. M. Carroll, ed. *Human-Computer Interaction in the New Millennium*. Addison-Wesley, New York, USA.
- Shneiderman, B., Plaisant, C. 2005. *Designing the User Interface*. Addison Wesley.
- Stalder, F. 1997. *Actor-Network-Theory and Communication Networks: Towards Convergence*. Available from: http://felix.openflows.org/html/Network_Theory.html [Accessed 2006-04-06].
- Steinbock, D. 2000. *Finland's Wireless Valley: From Industrial Policies Toward Cluster Strategies*. The Ministry of Transport and Communications Finland, 36/2001.
- Steinbock, D. (2003): *Globalization of wireless value system: from geographic to strategic advantages*, *Telecommunications Policy*, 27/2003, 207-235. In Karvonen, J., Warsta, J. 2004. *Proceedings of the 3rd international conference on Mobile and ubiquitous multimedia MUM '04* Publisher: ACM Press.
- Shapiro, C., Varian, H., R.1999. *Information rules: A Strategic Guide to the Network Economy*. Harvard Business School Press, Boston, Massachusetts.
- Suchman, L., 2003. *From Plans and Situated Actions in The New Media Reader*. The MIT Press Cambridge, Massachusetts, England.
- Sölvell, G., Lindqvist G., Ketels, C. 2003. *The cluster initiative green book*. Bromma Tryck Ab, Stockholm, Sweden.
- Uusikylä, P., Valovirta, V., Karinen, R., Abel, E. Froese, T. 2003. *Towards a competitive cluster - an evaluation of real estate and construction technology programs*. Technology Programme Report 6/2003, National Technology Agency Tekes. Helsinki, Finland.

Valtakari, M., Rajahonka, M. 2005. NETS – Networks of the Future 2001-2005. Evaluation Report, Executive Summary. Technology program report 12/2005, Tekes, Helsinki.

Van House, N. 2000. Actor-Network Theory, Knowledge Work, and Digital Libraries.
<http://www.sims.berkeley.edu/~vanhouse/bridge.html>

Varshney, U., Vetter, R. 2002. Mobile Commerce: Framework, Applications and Networking. Mobile Networks and Applications 7, 185–198. Kluwer Academic Publishers, The Netherlands.

Vasilescu, E. 2006. Service Oriented Architecture (SOA) Implications for Large Scale Distributed Health Care Enterprises. Proceedings of the 1st Distributed Diagnosis and Home Healthcare (D2H2) Conference Arlington, Virginia, USA, April 2-4.

Virkkunen, J. 2006. Dilemmas in building shared transformative agency. Center for Activity Theory and Developmental Work Research University of Helsinki. Available from: <http://www.activites.org/v3n1/html/virkkunen-en.html> [Accessed 2006-05-06].

Virtanen, E., Hernesniemi, H. 2005. Klusterin evoluutio – Prosessikuvaus. Tekes Technology Review 174/2005. Painotalo Miktor, Helsinki 2005.

Wang, J.J.; Song, Z.; Lei, P.; Sheriff, R.E. 2005. Design and Evaluation of M-Commerce Applications. Communications, 2005 Asia-Pacific Conference on IEEE, pp. 745-749. Available from: <http://www.lub.lu.se/cgi-bin/ipchk/http://elin.lub.lu.se/link2elin?genre=article&issn=&year=2005&volume=&issue=&collection=conf&pages=745-749&resid=79d2f78b4b4d8753646095720b7f291a&lang=se> [Accessed 2006-03-08].

Wallström, M. (2006-03-08) Hemtjänst sköts med handdatorer – IT i vården. Special issue, Computer Sweden, CS, IDG Communications, pp 2.

Winner, L., 1977. Autonomous technology. Technics-out-of-control as a theme in political thought. MIT Press.

Winograd, T., Flores, F. 2003. Using Computers: A Direction for Design in The New Media Reader. The MIT Press, Cambridge, Massachusetts, England.

www.microsoft.com. Accessed: May 25, 2006 from WWW:
<http://www.microsoft.com/sverige/products/office/applications/sharepoint/2003/default.asp>

www.skane.se. Accessed: May 18, 2006 from WWW:
<http://www.skane.se/templates/Page.aspx?id=137507>.

www.skanet.se. Accessed, May 25, 2006 from WWW:
<http://www.skane.se/templates/Page.aspx?id=43381>

www.sika-institute.se. Accessed, May 21, 2006 from WWW:
http://www.sika-institute.se/utgivet_fr.html

www.vinnova.se. Accessed, June 3, 2006 from WWW:
http://www.vinnova.se/vinnova_templates/Page____45.aspx

www.webstyleguide.com. Accessed, June 2, 2006 from WWW:
(<http://www.webstyleguide.com/process/develop.html>).

Yin, R., K. 1994. Case Study Research, Design and Methods. SAGE publications, California, U.S.A..

Yoffie, D., B., Cusumano, M., A. 1999. Judo Strategy: The Competitive Dynamics of Internet Time. Harvard Business Review, January-February, pp. 70-81.

Yoo, Y., Yang, H., Lyytinen, K. & Ahn, J.-H. 2005. The role of standards in innovation and diffusion of broadband mobile services: The case of South Korea. Journal of Strategic Information Systems 14, pp. 323–353. www URL:
<http://weatherhead.case.edu/pervasive/Paper/UBE%202003%20-%20Yoo.pdf>