Knowledge Transfer in Science Parks

Authors: Andreas Grassler  
Roman Glinnikov

Principal Tutor: Dr. Mikael Lundgren  
Co-tutor: Dr. Philippe Daudi

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Abstract

The contemporary information society demands efficient knowledge management and therefore, the transfer of knowledge becomes an important issue. The purpose of this research is to contribute to the understanding of how the knowledge transfer in Science Parks takes place and which knowledge transfer supporting conditions are offered within the Science Park environment.

Through the conduction of several in depth interviews with the management of Science Parks as well as the representatives of their tenant companies it can be concluded that Science Parks seem to offer favourable conditions for knowledge transfer. This is facilitated by the established structural arrangements as well as the supporting activities of the Science Parks' management.

An important assumption is made within the scope of this study that certain favourable conditions may as well be relevant for off Science Park firms and thus, presumably making the present study interesting and valuable for a larger audience.
Acknowledgement

In order to complete the final part of the Master’s Programme in Leadership and Management in International Context we have dedicated all our time to the writing of this Master’s Thesis. This would not have been possible without all the people who supported, encouraged and guided us during the process of our work.

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Thank you all!

Kalmar, May 2008

Andreas Grassler

Roman Glinnikov
‘If you have knowledge,  
let others light their candles with it’

- Margaret Fuller -
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1. Introduction

The present Master’s Thesis was written about knowledge transfer in Science Parks. Therefore the study has the following structure:

In order to introduce the idea of this research and the motivation behind it the first section, which is the outline of the study, describes the context in which the research is to be viewed. Furthermore, the purpose, focus and objectives are looked at and the importance of the study is justified before the actual research questions are presented.

This is followed by the methodology section where the models and approaches used during the actual process of research are presented. Therefore the relevant literature was reviewed and possible research strategies are discussed to draw more clarity on the eventually chosen models and approaches.

Afterwards the thesis presents the theoretical background for the topic of knowledge transfer. This is done by reviewing the literature on knowledge as a concept, its management and transfer, and finally on Science Parks and their characteristics. Additionally, to clarify the authors’ understanding of these issues, own definitions are presented when appropriate.

After these theoretical elements the thesis proceeds to the more practical part, which is the empirical study and its results. Firstly, the actual context and structure of the conducted study are presented to give the reader the needed understanding of the interpretations and analyses made. Secondly, general information concerning the Science Parks and studied companies is given in order to make the study even more transparent.

Thereafter the results of the research are presented in three parts which are dealing with the forms of knowledge transfer in Science Parks, the structural arrangements which support knowledge transfer and finally the support of the Science Park management regarding the knowledge transfer. With the aim of making the discussion of the results of the study more complete, the common barriers to knowledge transfer are looked upon in the fourth part of this section.

Last but not least, conclusions are drawn in order to develop a comprising picture of the accomplished research and to look over the edge of this particular study to show some possible applications of the results for off Science Park organizations. The possibilities for further research within the topic are discussed in the final part of our thesis.
2. Outline of the Study

2.1. The Context of the research

High-tech companies as well as research institutes face high competition in the modern globalized world. The number of competitors for the western firms increased constantly in the last decades and as a result the product development times decreased dramatically. This is partially based on the recent opening of the Asian markets and the resulting contemporary globalization of the business world. For example, China and India show very fast economic growth and come up with a high number of new enterprises which act as competitors for the companies in the established western economies. Moreover, the higher number of competitors stirs up the competition within almost all industries and therefore leads to shorter product development times as new products and innovativeness are highly important for success. Thus, companies have to invest large amounts of money in highly sophisticated research and development (R&D) departments to minimize their time-to-market times. Through this, lucrative first-mover advantages can be gained. But if a company fails to be ahead in the product development, there is a risk of a great financial loss.

Research institutes are facing a similar problem. The global competition and professionalism increased the pressure among them to come up with great developments faster than the competition. The half-life of knowledge and accordingly also innovations is getting shorter and shorter and thus, the research institutes have a higher pressure to publish and commercialise their results (Grosse, 2005). Moreover investors threat to cut their funds for the institutes if research results are shown too seldom or not with the expected success (Lombardi, Capaldi, & Abbey, 2007). This would result in even slower development times and decreased competitiveness.

Therefore, both kinds of organizations have to search for possibilities to strengthen their product development processes and to develop according to the latest trends in research and science.

To carry out more successful and highly innovative developments, the opening of the company’s own R&D department to cooperate with external research institutes can offer a great chance to gain the needed competitive advantages. Therefore, companies try to combine their knowledge among each other as well as with research institutes in order to improve their product development outcomes through working closer together.

In the recent times this happens frequently in Research or Science Parks where big research institutes, like universities, work in close relationship with corporations. They range from small start-up firms up to parts of the R&D departments of large international companies. They share facilities and do research on new technologies and scientific problems together. According to the research of Squicciarini (2007) these co-operations in Science Parks result in higher innovativeness and as a consequence in higher productiveness for the participants compared to out-of-park firms. Lööf and Broström (2006) come to the conclusion that
especially for manufacturing companies the co-operation has boosting effects for their inovativeness, whereas service companies do not benefit that much. This might be grounded in the nature of the knowledge these companies deal with. Manufacturing companies almost always work with technologies, in Science Parks usually high-technologies, which are based on practical knowledge, whereas the work of service firms is often based on intellectual knowledge. This intellectual knowledge has proven to be much harder to transfer and to share than hands-on knowledge and therefore it seems reasonable that service firms do not benefit as much as other companies from the co-operation in Science Parks.

As these co-operations are in the majority of cases a costly business, the companies not only hope to get new innovative products, which means only the explicit results, out of this collaboration, but also to transfer knowledge from the research institutes into their own company. From the employees in direct contact with the research institute, the ones who gain the knowledge first, the knowledge should be spread into the company and thus have a multiplying effect. If this happens, the whole organization can profit and use the knowledge gained during the co-operation. The research organizations profit from this connection as well. They get insights into the professional business world, can develop on the real product and at the same time already have customers for their inventions. Thus, in the ideal case, both partners benefit from the collaboration.

Nevertheless, before the gained knowledge can be spread into the own company, it has to be generated and transferred to the directly involved employees. This means that the people working in close contact with the scientists of the research institutes have to get familiar with the knowledge, explicit and tacit, supplementary and complementary, provided by the scientists, before they are able to pass it on into the whole organization they are working for.

The term explicit knowledge stands for knowledge which can be consciously identified and therefore articulated. In turn, tacit knowledge is knowledge people carry in their minds but are not aware of or cannot access it consciously. Polanyi (1966) in his widely used work says that “we can know more than we can tell and we can know nothing without upon those things which we may not be able to tell” (p. 4).

Talking about supplementary and complementary knowledge we refer to Knudsen (2007) who describes supplementary knowledge as highly redundant when it comes to innovative developments, knowledge and skills. Therefore it is easier to understand, utilize and it improves the short time progress. Complementary knowledge, in turn, has low redundancy and is more difficult to apply but pays off for the organizations in the longer term. Thus, a right mixture between both types of knowledge seems to be most efficient.

Concluding one can say that companies as well as research institutes face increased global competition and therefore have to use all possible ways to increase their competitiveness. One possibility for this is the close collaboration among these organizations to boost their innovation and product development times.
2.2. Main Focus of the study
For companies these collaborations only pay back if success is reached in the way that the knowledge can be transferred fruitfully into the organization. This means that the knowledge is not only transferred to the person interacting with the researcher and used only for one certain project, but is also transferred further on within the organization to open the door for additional use in the whole company. Thus, the focus of this study is to research how and whether at all knowledge transfer in these research collaborations takes place. Particularly, how the structural arrangements of Science Parks and the resulting close co-operation of the research institutes and companies support the knowledge transfer between the cooperation partners. Investigations of the conditions which maintain the transfer of knowledge are also done. The purpose of this is to find certain enablers of knowledge transfer which can be seen as valid, not only in the specific circumstances of Science Parks, but also when it comes to casual knowledge transfer in organizations independent from research institutes.

The study is also aiming to consider the risks of knowledge transfer. Companies which face high competition have to protect their corporate secrets, such as new product developments or intellectual properties, quite tight and therefore their knowledge. Correspondingly, around 30% of the participants in alliances perceive protecting their intellectual property rights as the most important obstacle (Hall, Link, & Scott, 2001). Hence, companies working close together with research institutes tend to be open for new knowledge from the research institutes but try to reveal as less as possible of their own knowledge in fear that competitors could get access to it in the future. As a result, it seems to be reasonable that the knowledge transfer would be restricted and cannot be utilized in the best way by both co-operation partners. Thus, it is interesting to investigate how the created conditions in Science Parks influence this attitude.

To examine these issues, a strategically chosen case involving a research institute and a cluster of companies was analyzed. The Science Park ‘Ideon’ in the southern Swedish city Lund offers the required characteristics of close co-operation between firms and a large research institute. At Ideon, the famous Lund Institute of Technology, the engineering faculty of Lund University, and numerous companies of different type work in close cooperation “to develop and grow to meet the demands of the open market” (Ideon Center AB, 2008). They share their knowledge about IT, biotech and other high-tech areas and build the ground for new innovative R&D. While working together both parties profit from each other’s knowledge and understanding of the high sophisticated research issues and try to transfer this new generated knowledge into their home organizations.

In a nutshell, the objectives of the study are to identify certain structures and conditions which enable or enhance the knowledge transfer between the co-operation partners and, furthermore, to detect areas where the transfer of knowledge is accomplished the most. Empirical data is provided by a case study on the Ideon Science Park.
2.3. The Research Questions

The first research question tries to reveal the ways how knowledge transfer in Science Parks actually takes place:

In order to be able to examine the knowledge transfer in Science Parks in more detail it is essential to have clear understanding of the procedures through which the knowledge transfer actually takes place. Therefore the study tries to reveal the most common ways people in Science Parks share their knowledge. This comprises the different relations involving knowledge exchange among the related organizations.

In the next step the second research question is directed at the analyses of knowledge transfer supporting conditions in Science Parks:

When it comes to the environment in which knowledge transfer takes place, the study seeks to discover certain structural arrangements within Science Parks which enable it. This means, that there might be characteristics which are unique for Science Parks and which facilitate and enhance the knowledge transfer in a certain way. Furthermore, when talking about supporting conditions one would be likely to consider barriers to knowledge transfer. It seems important to identify them in order to be able to utilize the knowledge transfer most effectively.

Finally, in the third research question, the study tries to analyse the management of Science Parks in terms of knowledge transfer enabling activities:

If prerequisites which enhance knowledge transfer can be found, the active management of them would be worth exploring in more detail as well. Therefore, it seems to be likely that the management of Science Parks plays an important role and thus, the activities of the Science Park management are in the main focus. This means that structural arrangements influenced by the management as well as actively organized events are also in focus.

In short, the objective of this thesis work is, to get an insight into the knowledge transfer and its enhancing conditions in Science Parks where research institutions and companies co-operate in research, product development or the daily business activities. The main research issues are to examine how the knowledge transfer takes places, which circumstances, particular for Science Parks, support it and how the Science Park management tries to enhance the knowledge transfer.
3. Methodology

In order to draw more clarity on the actual process of our research, it is necessary to introduce the methods and approaches we used during each phase of it. Therefore we review the literature covering the most widely used research techniques relevant to our study and reflect upon our own understanding of these methods and approaches. Moreover, at the end of each section we include statements justifying our choices.

3.1. Scientific paradigms

Different ways of thinking as well treating data exist in modern research and are reflected in the scientific paradigms. As an attempt to clarify our way of approaching data it was decided to discuss the following paradigms which occasionally come into conflict. Namely these are the ‘positivistic’ and ‘hermeneutic’ paradigms.

According to Rubenowitz (1980) positivism as a scientific paradigm assumes that only knowledge obtained by means of measurement and objective identification can be considered to possess truth. This knowledge is based on the statistical analysis of data collected by means of descriptive and comparative studies and experiments. The view that this model of reality provides the only true basis for explanation and general theory has occasionally come into conflict with a non-positivist – hermeneutic (interpretative) approach.

The appearance of hermeneutics represents a reaction against the ingrained rigidities of positivism in relation to certain types of problems in the social field. Instead of trying to explain casual relationships by means of objective facts and statistical analysis, hermeneutics is based on more personal interpretative approach which enables the participants to understand reality. Language takes on a central role, qualitative assessments partially replace quantitative data and general characteristics become of lesser interest than specific features. (Gummesson, 2000)

In order to make the differences between the positivistic and hermeneutic research more explicit, their main features are juxtaposed for the sake of comparison in Table 3.1 (Gummesson, 2000, p. 153).

<table>
<thead>
<tr>
<th><strong>Positivistic Paradigm</strong></th>
<th><strong>Hermeneutic Paradigm</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Research concentrates on description and explanation.</td>
<td>Research concentrates on understanding and interpretation.</td>
</tr>
<tr>
<td>Well-defined, narrow studies.</td>
<td>Narrow as well as total studies (holistic view).</td>
</tr>
<tr>
<td>Thought is governed by explicitly stated theories and hypotheses.</td>
<td>Researchers’ attention is less focused and is allowed to “float” more widely.</td>
</tr>
<tr>
<td>Research concentrates on generalization and abstraction.</td>
<td>Researchers concentrate on the specific and concrete (“local theory”) but also attempt generalizations.</td>
</tr>
<tr>
<td>Researchers seek to maintain a clear distinction between facts and value judgments; search for objectivity.</td>
<td>Distinction between facts and value judgments is less clear; recognition of subjectivity.</td>
</tr>
<tr>
<td>Researchers strive to use a consistently rational, verbal, and logical approach to their object of research.</td>
<td>Pre-understanding that often cannot be articulated in words or is not entirely conscious – tacit knowledge – takes on an important role.</td>
</tr>
</tbody>
</table>
Statistical and mathematical techniques for quantitative processing of data are central. Data are preliminary non-quantitative.

Researchers are detached, i.e., they maintain a distance between themselves and the object of research; take on the role of external observer. Both distance and commitment; researchers are actors who also want to experience what they are studying from the inside.

Distinction between science and personal experience. Researchers accept influence from both science and personal experience; they use their personality as an instrument.

Researchers try to be emotionally neutral and make a clear distinction between reason and feeling. Researchers allow both feelings and reason to govern their actions.

Researchers discover an object of research external to themselves rather than “creating” the actual object of study. Researchers partially create what they study, for example the meaning of a process of a document.

<table>
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<tr>
<th>Table 3.1: Comparison between the Positivistic and Hermeneutic Paradigms</th>
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| It should be said, though, that both positivism and hermeneutics lay much emphasis on creativity and the ability to see reality in a new light. Analytical requirements, however, receive a higher priority in positivistic research than creativity and novel approaches (Gummesson, 2000). In hermeneutics the researcher tries to escape the conventional wisdom and recognize new things under familiar circumstances. In today’s highly sophisticated world of wicked problems (De Wit & Meyer, 2004) hermeneutic research methods allow one to get to the core of the problem, instead of concentrating on superficial data, and therefore prove to be quite useful. Nevertheless, one must not draw too sharp distinction between qualitative and quantitative research. Qualitative research can mean many different things, involving a wide range of methods and contrasting models. Everything depends on the research problem that needs to be analyzed, as it was stated before. The following statement shows the absurdity of pushing too far the qualitative/quantitative distinction (Silverman, 2005):

> We are not faced, then, with a stark choice between words and numbers, or even between precise and imprecise data, but rather with a range from more to less precise data. Furthermore, our decisions about what level of precision is appropriate in relation to any particular claim should depend on the nature of what we are trying to describe, on the likely accuracy of our descriptions, on our purposes, and on the resources available to us; not on ideological commitment to one methodological paradigm or another. (Hammersley, 1992, p. 163)

In our research we have decided to favour the qualitative research approach along with the hermeneutic paradigm. The reason behind this is that knowledge is impossible to measure. There are no devices or tools other than ones imagination and reasoning abilities that would let one observe and analyze the process of knowledge transfer. Therefore the quantitative research methods seem to be inappropriate in our case. What we tried to do was to escape the influence of categories that can be axiomatically accounted for and to look into the core of the research problem and then to describe it in full detail without being trapped into ‘conventional wisdom’. Other reasons behind this choice will be explained further in the part where we will justify our choice of research strategy and data collection methods.
3.2. Pre-understanding and understanding phases

Before starting a research it is important to have a certain degree of pre-understanding. The concept of pre-understanding, according to Gummesson (2000), refers to people’s insights into a specific research problem before they start the actual research; it serves as the input. Whereas, understanding refers to the insights gained during the actual research; it is the output of the study. This output in turn serves as pre-understanding for the next task. Usually the pre-understanding appears in the form of theories, models, and techniques as well as personal experiences, while it generally lacks knowledge of conditions under specific circumstances.

As can be seen from Figure 3.1, the main sources of pre-understanding are our own experience and the experience of others derived from textbooks, internet sites, case studies, research reports, scientific articles, etc. Ultimately, all of this information passes through our frames of reference, and then we make sense of it and decide whether it is relevant to our research and worth using as a part of pre-understanding (Weick, 1995).

![Diagram of the flow of pre-understanding](image)

**Figure 3.1: Sources of pre-understanding**

While a lack of pre-understanding may cause significant trouble during the actual research (lack of awareness of fundamental issues within the frame of research, time loss, due to necessity of gathering the basic information, etc.), it may as well serve as a source or rigidity towards innovative thinking. While Glaser and Strauss (1967) suggest that “an effective strategy is, at first, literally to ignore the literature of theory and fact on the area of the study” (p. 37), the most reasonable, according to Gummesson (2000) and to us, is to escape practicing split personalities and stick to dual personalities: “Those who are able to balance on the razor’s edge use their pre-understanding but are not their slave” (p. 56). Therefore it seems reasonable that the pre-understanding shall not be ignored but at the same time shall not serve as the only guide.
Figure 3.2 reflects the development of understanding. Through personal access to the studied phenomenon researchers are able to gain certain insight of their own. At the same time they apply the methods that allow them to analyze and interpret the experience of others.

Our research is divided in terms of research strategy and data gathering methods into the pre-understanding and understanding phases. The contents of each phase will be discussed in full detail further in this section.

3.3. Qualitative and Quantitative research

In order to draw more clarity on the distinction between quantitative and qualitative research it would be reasonable to reflect upon our understanding of these research approaches based on the reviewed literature. Qualitative analysis involves words and other data which come in a non-numerical form. Whereas quantitative analysis involves numbers and other data that can be transformed into numbers (Robson, 1993). In order to bring more essence to the discussion it is worth mentioning Denzin and Linkon’s Handbook of Qualitative Research (2000), where they state that qualitative researchers stress the socially constructed nature of reality, the intimate relationship between the researcher and what is studied and the situational constraints that shape the inquiry. They seek answers to questions that stress how social experience is created and given meaning. In contrast, quantitative studies emphasize the measurement and analysis of casual relationships between variables, not processes. Proponents of such studies claim that their work is done from within a value-free framework. Quantitative researchers simply rely on more inferential empirical methods and materials.

A sports team can be used as an example. Its performance can be translated into numeric form and is constantly stored in specific databases. Therefore, if one decides to explore the ups and downs in the performance of a single athlete within a certain time-frame, it would be possible to do so by concentrating on the quantitative research techniques. But if one...
finds out that during a certain period of time there was a dramatic decrease in the athlete’s performance, while he did not have any injuries (whereas the real reason was a nervous breakdown) and one needs to know the reasons behind that, the only way to answer the question is to investigate his personal circumstances through an interview, which tends to be one of the tools of qualitative research.

The example above is also an illustration of an extremely important feature of modern research: it is most of the times inappropriate to talk or think about qualitative and quantitative research in terms of their advantages and disadvantages; instead it seems to be most reasonable to look at both of these approaches in terms of their appropriateness in each case. Most of the methodology scholars reviewed seem to agree on this issue as well. Therefore one has to take into account the research question and the objectives of the research before choosing the appropriate methodology. On the other hand, if one happens to be keen on doing either qualitative or quantitative research one has to carefully formulate the research question and state the objectives.

Qualitative researchers tend to work with a relatively small number of cases. Therefore they are prepared to sacrifice scope for detail. While quantitative researchers seek more clarity in the correlations between variables, their qualitative opponents strive for detail in such matters as people’s understandings and interactions. This is due to the fact that qualitative researchers lean towards the use of a non-positivist model of reality as opposed to a positivistic one (Silverman, 2005).

3.4. Research strategy
According to Robson (1993) there are three basic research strategies: experiment, survey, and a case study.

Experiment is a research strategy involving:

- the assignment of subjects to different conditions;
- manipulation of one or more variables (called ‘independent variables’) by the experimenter;
- the measurement of the effects of this manipulation on one or more other variables (called ‘dependent variables’); and
- the control of all other variables (p. 78).

The main features of the survey research strategy are the following:

- the collection of a small amount of data in standardized form from a relatively large number of individuals; and
- the selection of samples of individuals from known populations (p. 124).

It is evident from definitions mentioned above that both of these research strategies concentrate mainly on the quantitative approach, place emphasis on variables and on sampling from known populations and strive to create a quantitative picture of the world.
3 Methodology

The third research strategy is conceptually different from the other two. According to the pioneer of case study research strategy, Robert K. Yin (1994), a case study is an empirical enquiry that:

- investigates a contemporary phenomenon within its real-life context; when
- the boundaries between phenomenon and context are not clearly evident; and in which
- multiple sources of evidence are used (p. 13).

In order to determine the appropriateness of using case study as a research strategy, Yin proposed the researchers to ask themselves three questions:

1. What is the type of your research question?
2. To which extent do you, as an investigator, have control over the actual behavioural events?
3. What is the degree of focus on contemporary as opposed to historical events?

In our case the fact that, firstly, the type of our research questions is a ‘how’ question, secondly, we possess no control over the actual behavioural events involved in the knowledge transfer in Science Parks, and, thirdly, that we focus on contemporary rather than historical events, justifies the choice of the case study as our research strategy.

Qualitative research and hermeneutic paradigm serve as core concepts of a case study, which is also one of the reasons why we have chosen it as a research strategy. One of the main advantages of a case study is its flexibility. Moreover, a failure to follow the pre-determined set of activities in such research strategies as experiment and survey would be likely to result in serious implications. Opponents of case studies argue that it is impossible to generalize on the basis of one empirical example. Nevertheless, Gummesson (2000) states that “in-depth studies based on exhaustive investigations and analyses to identify certain phenomena, allow the researcher to lay bare mechanisms that one suspects will also exist in a different environment” (2000, p. 90). It is important to keep in mind that, when everything depends on a single case, the possibility of a sloppy approach may have tremendous implications. We are also aware that it is difficult to evaluate the quality of a case study and therefore, we hope that our statements are plausible enough for the reader to conclude that the purpose of our research was successfully reached.

Yin (1994) distinguishes between three types of case studies: exploratory, descriptive, and explanatory. Our case study is agreed to be a descriptive one, since we tried to describe the process, content, and context of knowledge transfer in Science Parks with all of the peculiarities involved in it.

In fact most of the features of our research are reflected in the description of a ‘naturalistic enquiry’ which was introduced and outlined by Lincoln and Guba (1985) and enhanced and put together by Robson (1993). The main characteristics of ‘naturalistic enquiry’ are the following:
1. **Natural setting** – research is carried out in the natural setting or context of the entity studied.

2. **Human instrument** – the enquirers, and other humans, are the primary data-gathering instruments.

3. **Use of tacit knowledge** – tacit (intuitive, felt) knowledge is a legitimate addition to other types of knowledge.

4. **Qualitative methods** – qualitative rather than quantitative methods tend to be used (though not exclusively) because of their sensitivity, flexibility, and adaptability.

5. **Strategic sampling** – purposive sampling is likely to be preferred over representative or random sampling, as it increases the scope or range of data exposed and is more adaptable.

6. **Inductive data analysis** – inductive data analysis preferred over deductive as it makes it easier to give a fuller description of the setting and brings out interactions between enquirer and respondents.

7. **Grounded theory** – preference for theory to emerge from (be grounded in) the data.

8. **Emergent design** – research design emerges (unfolds) from the interaction with the study.

9. **Negotiated outcomes** – preference for negotiating meanings and interpretations with respondents.

10. **Case study reporting mode** – preferred because of its adaptability and flexibility.

11. **Idiographic interpretation** – tendency to interpret data idiographically (in terms of the particulars of the case) rather than nomothetically (in terms of law-like generalizations).

12. **Tentative application** – need for tentativeness (hesitancy) in making broad applications (generalizations) of the data.

13. **Focus-determined boundaries** – boundaries are set on the basis of the emergent focus of the enquiry.

14. **Special criteria for trustworthiness** – special criteria for trustworthiness (equivalent to reliability, validity, and objectivity) devised which are appropriate to the form of the enquiry (Robson, 1993, p. 61). In our case it is credibility, transferability, dependability, and confirmability.

Since the Grounded Theory (Glaser & Strauss, 1967) was mentioned above, it is necessary to explain how we understand it and which implications it will have on our research. One of the most valuable contributions to the field of theory made by Glaser and Strauss was the distinction that they drew between *theory generation* and *theory testing*. The authors concentrate in their work on the generation of theory, the attempt to find new ways of looking at reality, the need to be creative and receptive with the aim of improving one’s understanding. In contrast, mainstream researchers are concerned primarily with the testing and refinement of existing theories.
Gummesson (2000) illustrated the Grounded Theory with the following example of the latest developments that have taken place within marketing in Scandinavia and other parts of Europe during the 1980’s: new conceptual developments of service management, services marketing, and industrial marketing have been grounded in empirical data gathered in case studies. This was in contrast to the mainstream marketing research that was focused on the testing of the traditional consumer goods oriented ‘marketing-mix’ theory (p. 84). Thus, according to Glaser and Strauss, theories and models should be grounded in actual empirical observations rather than be governed by traditional, established approaches.

Therefore, in our research we tried not to be the slaves of our pre-understanding and to assess the validity of existing theories, but rather develop some kind of a new theory or at least add more flavour to an existing theory.

3.5. Data gathering methods

According to Robson (1993) there are three basic methods of qualitative data collection: observation, interview and content analysis.

Observation – involves watching (observing) the phenomenon in its natural environment without interrupting it; then analyzing and interpreting what one saw.

Interview – is a conversation with a person (or a number of people) somehow involved in the studied phenomenon with a purpose of gathering relevant information and motivated by research objectives.

Content analysis – is referred to as an indirect observation and involves the gathering and analysis of information from books, magazines, newspapers, official documents, statistical reports, scientific articles, publications, research reports, case study reports, Internet websites, documentaries, films, pictures and other sources.

During the pre-understanding phase of our research, which covers the time before the actual case study, the main data gathering method that we used was the content analysis. All of the information, primarily of secondary nature, needed to build the theoretical frame for our study, was collected during this phase through the means of written and published resources. All of the desired primary information, during the actual case study, was collected through the use of interviews combined with occasional observations. We have chosen focused interview as the main primary data gathering method. A focused interview (as opposed to structured one) is “an approach which allows people’s views and feelings to emerge, but which gives the interviewer some control” (Robson, 1993, p. 240). The interview is a flexible and adaptable way of finding things out and this method suits the quantitative and hermeneutic approach that we have decided to adopt together with a case study research strategy. Therefore, we believe that this kind of tactics enabled us to get closer to the core of knowledge transfer and conditions surrounding it within Science Parks, as well as to reflect upon it in an appropriate and desired manner in our research paper. However,
we are aware that the appropriate and effective use of this data gathering method demands considerable skill and experience in the interviewer.

3.6. Quality assessment
Seale (1999) in his book *The Quality of Qualitative Research* emphasizes the importance of being ‘methodologically aware’:

Methodological awareness involves a commitment to showing as much as possible to the audience of the research studies ... the procedures and evidence that have led to particular conclusions, always open to the possibility that conclusions may need to be revised in the light of new evidence. (p. x)

Having proper intentions and correct attitude towards research is never enough and should be supported with the revealment of the used procedures to the audience. This in order to justify that the methods are reliable and the conclusions are plausible enough.

In qualitative research everything is centred on a human and his information gathering as well as analytical abilities. Therefore, the quality assessment has to be approached differently from how it is done in quantitative research. Lincoln and Guba (1985) offer four dimensions along which one can determine the overall quality of qualitative research. These are *credibility*, *transferability*, *dependability* and *confirmability* which were later refined and carefully organized by Robson (1993) in the following way.

**Credibility** – the degree to which the enquiry was carried out in a way which ensures that the subject of the enquiry was accurately identified and described (p. 403).

**Transferability** – the extent to which the case and the finding described can be transferred to other settings (p. 405). The aim of the researcher is to provide the database that makes the transferability judgments possible for potential applicers (Lincoln & Guba, 1985, p. 316).

**Dependability** – refers to the degree to which the processes followed are clear, systematic, well documented, providing safeguards against bias, etc. One should also be aware that dependability derives from credibility, but not necessarily vice versa. (Robson, 1993, pp. 405-406)

**Confirmability** – the extent to which the actual findings of the research flow from the data collected (Robson, 1993, p. 406).

Inspired by Seal, Lincoln, et al., and Robson we tried to conduct the credibility, transferability, dependability, and confirmability tests of our research on regular basis in order to make sure that the overall quality of our work meets the required standards as well as our expectations.
3.7. Summary of the methodological approaches used

In a nutshell we conclude that our research is based on qualitative research methods, derived from the hermeneutic scientific paradigm. The overall research process was divided into the pre-understanding and understanding phases and, moreover, the research strategy, adopted during the whole process was a case study. As far as the data collection methods are concerned, we used content analyses during the first phase and interviews during the second phase. In order to challenge our assumptions, quality assessment tests were carried out constantly.
4. Theoretical Background

4.1. Introduction
To build a solid ground for the research and to clarify the understanding of the topic, some basic definitions and specifications of the study seem to be necessary in the beginning. Therefore, in order to provide the basic background, the available literature is reviewed and summarized. To meet the needs of this research, firstly, the term 'knowledge' is defined and some classifications of knowledge are presented. A great number of researchers already worked on this issue and on basis of their work we can define what ‘knowledge’ means to us in the context of the research. Thereafter, the sources of knowledge in organizations are discussed and the process of knowledge generation is investigated.

Reaching deeper into the topic the management of knowledge and its transfer are examined in the next part of this chapter. General definitions of knowledge management together with strategies of its accomplishment are discussed. Moreover knowledge transfer, the core of the study, and some obstacles to it are discussed.

In order to make the reader’s understanding of the topic more embracing, Science Parks, their tenants and the linkages within Science Parks are summarized and discussed in the third part of this chapter.

4.2. The Concept of Knowledge
When it comes to the field of knowledge a broad variety of authors already carried out research and wrote on this topic. They offer different definitions, classifications and sources for knowledge which we will discuss in this section of the paper to be able to express our own understanding of the term ‘knowledge’. Special attention is paid to the issue of how knowledge can be defined and where it can be found. Moreover, we examine deeper the process of knowledge generation.

4.2.1. Definitions and classifications
A very basic definition of knowledge is provided by Colman (2001). He describes it as “anything that is known” and classifies knowledge into three categories. Declarative knowledge, which means the knowing that, the awareness of certain information in general, procedural knowledge, which means the knowing how, the idea of how to carry out activities, and acquaintanceship knowledge, which describes things we know unconsciously. Davenport and Prusak (1998) go in more detail and define knowledge as “a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers.” (p. 5) They argue that data is formulated into information and when the information makes sense to and is absorbed by the receiver it becomes new knowledge. Thus, knowledge can be basically seen as the result of this process (see Figure 4.1). Furthermore, they state that knowledge is something complex and “hard to capture in words or understand completely in logical terms.” (p. 5)
Polanyi (1966) in his works introduces such categories as explicit and tacit knowledge. Explicit knowledge is knowledge which can be “articulated and, more often than not, captured in the form of text, tables, diagrams, product specifications” (Nickols, 2000) whereas tacit knowledge cannot be expressed easily in words. It is the knowledge one carries in its mind, often without being aware of it, and it is difficult to access as one often doesn’t know how to make it valuable for others. Gummesson (2000) argues that “In France even small children speak French fluently’. And they certainly do, but they would not be able to articulate the structure of the French language and its grammar since it is a tacit cognitive map.” (p. 17) While explicit knowledge is relatively easy to transfer and absorb, it is quite different, with tacit knowledge. Polanyi argues that “we can know more than we can tell and we can know nothing without upon those things which we may not be able to tell” (Polanyi, 1966, p. 4). However, tacit knowledge does not necessarily have to be articulated in order to be transferred. An individual must simply possess and know how to appropriately use the tools to understand information from the outside world. Moreover, knowledge is called implicit knowledge, if it could be articulated but hasn’t yet. Tacitness is seen as one of the main barriers to knowledge transfer by Polanyi as well as many other researchers.

Minbaeva (2007) takes Polanyi’s discussion onto another phase. She defines tacitness in terms of how difficult it is to articulate and codify a given domain of knowledge. She argues that a higher degree of tacitness, first, decreases the speed of transfer, since tacit knowledge is hard to articulate with formal language or express directly and, second, influences the outcomes of knowledge transfer due to its impact on knowledge ambiguity. Along with tacitness she adds two more characteristics to knowledge. The first is complexity which has to do with the amount of information required to describe the specific part of knowledge in
question. The second is specificity which reflects the degree to which knowledge is about specific functional expertise. Minbaeva finds it extremely useful to look at knowledge receivers in terms of their absorptive capacity which, in turn, depends on their abilities and motivation; and at knowledge senders in terms of their ability and willingness to share knowledge.

The tacitness of knowledge is explored further by Lahti and Beyerlein (2000). They argue that tacit knowledge can be divided into cognitive and technical elements. “The cognitive element can be described as mental models that allow individuals to create functional representations of their world by using analogies in their minds”. (p. 66) As an example they mention paradigms, schemata, and beliefs that enable people to understand their environment. “The technical element of tacit knowledge deals with definite skills and know-how in a specific context.” (p. 66) For instance the language speaking skills of French children as mentioned before. With an attempt to reflect the true nature of knowledge and knowledge transfer the authors introduce the knowledge continuum. This implies that knowledge exists on a continuum where some forms of explicit knowledge may possess stronger tacitness than others. While some forms of tacit knowledge may be easier to articulate than others. Thus, knowledge is never just tacit or explicit but always belongs somewhere between the two extremes. This is illustrated in Figure 4.3. (Lahti & Beyerlein, 2000, p. 66).

![The Knowledge Continuum](image)

**Figure 4.3 The Knowledge Continuum**

Knudsen (2007) offers another dimension, along which it would be useful to divide knowledge. He proposes to look at it as supplementary and complementary knowledge. Supplementary knowledge is characterized by high degrees of redundancy in the form of similar product development, knowledge and skills. Complementary knowledge is characterised by low degrees of redundancy in the form of dissimilar product development, knowledge and skills. Knudsen concludes that supplementary knowledge is easier to apply and use in the short run. Therefore firms primarily exchange supplementary knowledge which tends to be knowledge within their area of expertise, whereas complementary knowledge is a source of success in the long-term. Thus, it is up to the manager to maintain the balance between short- and long-term payoffs. Knudsen also argues that private research institutes as well as universities are important resources of complementary knowledge as they provide innovative technical and scientific knowledge.
For research on knowledge transfer in Science Parks any kind of knowledge is relevant. Explicit and tacit as well as supplementary and complementary knowledge are appropriate to observe upon their transferability.

For this study we define and understand knowledge in general as complex, absorbed, coded information which is interpreted and internalized by the person and thus, based on this experience, offers the possibility to carry out activities with clear purpose and idea. As tacit knowledge we define knowledge which is usually not possible to express in words and is based on experience, skills or talent.

4.2.2. Sources of Knowledge

For the study and therein the identification of knowledge and later its transfer within Science Parks it is essential to be aware of where knowledge can be found. Therefore the sources of knowledge in organizations have to be identified.

Firstly, one can find knowledge in real, physical objects. All written papers, manuals, working instructions, emails, etc., contain explicit knowledge which the author was able to articulate and therefore pass on within the organization. These sources of knowledge can be comparatively easily exploited and used for the organizational learning process. Especially when this knowledge in form of written information is available for everyone in the organization, an interested person could relatively easily access the information and start the knowledge gaining process through understanding and absorption of it. A necessary prerequisite for this is the awareness of the availability of the information.

Another form of tangible knowledge sources is the products of an organization. A final product often reflects the knowledge an organization possesses within a certain area. This might be easier to recognize in manufacturing firms where the product is more tangible than in service companies. For example, it is relatively easy to assess the knowledge a company possesses by looking at the latest product developments. Nevertheless, a product most of the time shows only a certain fraction of the knowledge needed to develop it. Moreover, the way of producing and therefore needed skills and background knowledge can only be determined through further investigations.

Thus, these sources of explicit knowledge are available and relatively easy to access as long as the person who should receive the knowledge is aware of the existence and has access to the knowledge base.

Secondly, knowledge in organizations is present and stored in the minds of employees. This is the most valuable source of data, information and knowledge as it is the most comprehensive source, already available and has the possibility for further growth. Davenport and Prusak (1999) state that, “unlike material assets, which decrease as they are used, knowledge assets increase with use: Ideas breed new ideas, and shared knowledge stays with the giver while it enriches the receiver” (p. 17). Independently if the knowledge is explicit or tacit, the owner can access and use it. Therefore, to identify the knowledge
possessed by employees, as a colleague or an outside person, observation and interaction can be the keys to its exposure.

A third base of knowledge is in the work people do. This knowledge can be explicit and tacit and seen in the results of their work as well as in the process of how they accomplish their tasks. For example, knowledge detected here can be a specialist’s knowledge of a certain task, experience how to accomplish a task most successfully or tacit skills which make a person more suitable for a certain task than another. Moreover, the pure interaction of people is a great resource for learning and therefore knowledge gaining (Inkpen, 1998). Thus, to discover the knowledge contained in the work, one should have a closer look at the way the work is accomplished and to communicate with the person involved.

For a study on the transfer of knowledge it is essential to see where the knowledge in the observed organization is located. Therefore all accessible sources have to be approached. For us this means that not only the direct communication between people had to be analyzed, but also deeper investigations of the way of working, the results of the work and the tangible knowledge sources had to be examined.

4.2.3. Generating knowledge

Knowledge transfer can only been seen as a successful process if the receiver of the information can gain knowledge from it. Thus, the knowledge generation is an important part of knowledge transfer. As mentioned before, knowledge is defined within this study as complex, absorbed, coded information which is interpreted and internalized by a person. Hence, the basic prerequisite for new knowledge generation is the availability of information. According to definr.com (2008) information can be defined as “a collection of facts from which conclusions may be drawn”. Davenport and Prusak (1998) state that healthy organizations absorb information, turn it into knowledge and upon this execute activities which are dependent on their experiences, values and rules.

As organizations are consisting of people, the knowledge generation of organizations is directly dependent on the learning activities of their members. For this individual learning process, Daudi (1986) argues that “knowledge is produced through immediate and intuitive perception of the human experience” (p. 130) and Weick (1995) explores this thought deeper in his theories on sense making. He argues that the generation of knowledge is a process of sensemaking and thus, that knowledge can only be gained if the person can make sense out of the available information. Therefore, everybody uses its personal frame of references, which is determined by prior experiences and knowledge, to connect it with the new information and as a consequence understands and absorbs it as new knowledge. This leads to an enhanced frame of references and an increased learning capacity for the future. Thus, the knowledge gaining possibilities of a person rise with increased experience and knowledge. Moreover, the knowledge creation process is something that cannot be done
without an impulse from another person or at least needs an external trigger to start it (Nonaka, Toyama, & Konno, 2001).

For us it seems appropriate to recognize knowledge generation as a process which cannot be observed easily; neither through looking on tangible knowledge sources nor through listening to conversations. The interpretation, coding, understanding, sensemaking and eventually the internalization of new information, which is the same for everybody, is strongly dependent on the individual who is seeking to gain the knowledge. Thus, the successful generation of knowledge needs certain prerequisites attributed to the person, such as experiences or other suitable knowledge, fitting to the information which should be transformed into knowledge. Therefore one can say that the capacity of an organization to generate knowledge increases as more experience and knowledge is owned by its members. This is not only valid for conscious absorption of explicit knowledge but also for the mainly unconscious absorption of tacit knowledge. Moreover the transfer of knowledge within or between organizations is seen as another element of the knowledge generation process. If the knowledge does not emerge from own observations or experiences the knowledge has to be transferred from another person.

### 4.3. Knowledge Management and Transfer

After having a closer look at the term ‘knowledge’, its sources and generation, one can now focus on the management of knowledge and its transfer. In particular we discuss some definitions of knowledge management, organizational learning and how the management can be accomplished. Afterwards, we proceed to a more detailed discussion of knowledge transfer and, finally, some barriers to knowledge transfer between organizations are investigated.

#### 4.3.1. Knowledge management

The knowledge within organizations is an important asset and enabler of success. It is crucial to manage the knowledge successfully and to find methods of creating greater value for the organization out of it (Grant, 1997). Therefore it is essential to establish an environment of organizational learning and to utilize the knowledge of the organization’s employees in the best way. This enables to manage the knowledge and make it available for as many people as possible who might have a necessity for it. The critical point is to make the knowledge, gained by one person, accessible for the whole organization. As it is not possible for a person to own all the knowledge of an organization, the knowledge has to be accessible when needed rather than stored in everybody at the same time. Therefore, to be able to detect the right knowledge source at the given time, the knowledge base of a company has to be accurately managed.

Senge (1993) came up with the concept of a learning organization and put its learning (knowledge sharing and absorbing) capabilities above all the others. Nonaka and Takeuchi (1995) discuss the basic conditions under which a knowledge-creating company has to be
formed whereas Chen’s (2007) research centres on questions of how to guide the transformation of social learning groups into a functional knowledge community. Inkpen (1998) argues that alliances can create powerful learning opportunities. Therefore, active management of the learning process and the understanding of the nature of alliance knowledge are necessary. It is essential to be prepared to deal with such issues as knowledge spillovers and tacitness of knowledge. A firm must have the capacity to learn and have the necessary processes and systems for knowledge to be acquired. Boisot (1995) uses a codification-diffusion theory to describe in a visualizable way the conditions under which new knowledge can be structured and shared both within and between firms. He also introduces a dynamic model of learning.

Knowledge management is defined in many varieties in the corresponding literature. Davenport and Marchard (1999) state that knowledge management has mainly two tasks, which are “to facilitate the creation of new knowledge and to manage the way people share and apply it” (p. 2). Moreover Malhotra (1998) states that knowledge management “embodies organizational processes that seek synergistic combination of data and information processing capacity of information technologies and the creative and innovative capacity of human beings” (p. 58). The knowledge management as a process is also emphasized by Knapp (1998) who sees knowledge transfer as “the art of transforming information and intellectual assets into enduring values” and further on as a “strategic, systematic program to capitalize on what the organization ‘knows’” (p. 3).

For our approach to the topic, Knapp’s ideas seem to be quite apposite. We also see knowledge management mainly as a tool which serves to facilitate the knowledge generation and to utilize the available knowledge best within any kind of organization. This means that the members of an organization should enhance their knowledge constantly and moreover be aware of the knowledge available within the organization in order to be able to access it when the necessity occurs. To ensure this, the knowledge base has to be managed in an appropriate way.

4.3.2. Strategies for managing knowledge
For managing the knowledge in an organization and therefore also the knowledge transfer, different strategies are possible. A research in several different industries conducted by Hansen, et al. (1999) showed two different ways of managing the knowledge base within organizations: codification strategies where the “knowledge is carefully codified and stored in databases, where it can be accessed and used easily by anyone in the company.” And personalization strategies where the “knowledge is closely tied to the person who developed it and is shared mainly through direct person-to-person contacts” (p. 107). In other words, the first variant dissociates the knowledge after it was gained from the person and tries to make it sustainable through storing in computerized databases. This requires that the knowledge is possible to articulate (explicit knowledge) and covers therefore, as discussed before, only a certain fraction of the knowledge available in an organization. The missing
part, the tacit dimension of knowledge, is more likely to be utilized in the second variant of the mentioned knowledge management strategies. Through using a personalization strategy, there is a need to get in personal contact with the holder of the knowledge and therefore additional tacit knowledge can be communicated – consciously or unconsciously. Nevertheless, in bigger organizations a single personalization strategy would hardly work as it becomes more and more difficult to identify the right knowledge resource the bigger the organization is. The complexity is too high and scarcely anybody can know everybody and everybody’s knowledge resources. Therefore authors such as Creech (2005) and Wu (2007) argue that the most suitable and sustainable approach to knowledge management is a mix of different strategies. They discuss combinations of such strategies as: internal communications strategies, influencing strategies, communications strategies, and administrative strategies.

Another difficulty in managing knowledge is that managing intangible assets like knowledge and its transfer are seldom easy to measure in terms of success and sustainability. This is because the subject does not directly involve hard facts like earnings or amounts and therefore results are only able to be seen, if at all, a couple of steps further in the value chain. Consequently, certain researchers try to measure the knowledge transfer between companies and research institutes by investigating the innovativeness through looking at the number of registered patents compared to companies which do not co-operate with these institutes (Squicciarini, 2007). Minbaeva (2007) in her study tried to measure the degree of knowledge transfer by using a statistical combination of different determinations such as the characteristics of knowledge, knowledge receivers, knowledge senders and the relationship between receivers and senders.

To break the area of knowledge management down to the management of knowledge transfer within organizations one has to find a way to communicate and sustain new knowledge into and within the organization. For example this knowledge could be gained by a member of the organization through contact with researchers in Science Parks. Therefore an appropriate management strategy would be the one which connects the advantages of codification, like the longevity of the stored information, and the personalization, like the important influence of tacit knowledge and personal skills. If this can be accomplished the intellectual assets of a company should be easier to sustain and enhance.

### 4.3.3. Knowledge transfer

One ambition of knowledge management within organizations is to share the knowledge available between the members and thus to increase the productivity and the potential of everybody.

In the literature reviewed, knowledge transfer is defined as a communication process with information processing activities (Jasmuddin, 2007), and as a process of knowledge exchange where the interpersonal connection between sender and receiver as well as the
characteristics of the knowledge determine the effectiveness of the transfer to a certain extent (Szulanski, 2003).

Teece (2000) argues that the basis for competitive advantages lies in knowledge assets and therefore the sustainability of the competitiveness depends, among other factors, on the ability to create and transfer knowledge. Inkpen (1998) adds that “in all organizations, new knowledge is the lifeblood of experimentation, innovation, and change” (p. 223) and that not only the knowledge within organizations has to be shared but also new external ideas and knowledge have to be transferred into the organization as they provide the capacity for organizational renewal.

This outside-in knowledge transfer has specific challenges for organizations, as the collaboration with external institutes or companies more often than not exist only for a limited period of time, and therefore particular knowledge management systems are seldom installed (Griffith University & BML Consulting, 2002). Thus, the knowledge transfer takes place most of the time unconsciously or with some kind of spontaneous, ad-hoc management. Other reasons for the frequent lack of knowledge transfer management are the tacitness and complexity of knowledge, the difficulty to measure the transfer of it and, as Jasmuddin (2007) additionally identified, a research gap in defining appropriate ways of transferring knowledge. Thus, it is difficult for managers to find the right tools to ensure the knowledge transfer and to make it most efficient.

Walter et al. (2007) decided to take a deeper look at inter- and intra-firm network as basis for knowledge transfer. The focus of their study is on the ability of organizations to gain access to and transfer external knowledge between them and their strategic alliance partners. They conclude that this knowledge-access could be complemented by the participation of firms and their employees in other inter-firm co-operations, such as technical committees, professional associations, jointly authored technical papers, informal resource exchanges, interlocking board directorships and ownership links. It is extremely important that the interaction between different networks of this kind is taken into account.

Chua (2008) emphasizes the great importance of knowledge transfer, as knowledge that is not transferred will be lost. One of his fundamental findings is that self-appraisals such as tests, interviews and team appraisals are key sub processes of knowledge transfer. They can be adopted as one of the means to ensure that what is transferred is indeed learned by the receiver in the knowledge transfer process.

In order to reflect upon our reasoning path behind the presented concepts, the following Figure 4.4 illustrates the connection of knowledge, knowledge management and knowledge transfer.
To narrow down the wide field of knowledge transfer to an area which hasn’t been comprehensively researched until now, we focused our study on knowledge transfer in Science Parks and on the conditions which support and enhance the knowledge transfer activities and their success.

### 4.3.4. Barriers to knowledge transfer

Even though the transfer of knowledge is generally considered as something very valuable and even necessary for success in the modern business world, barriers to knowledge transfer exist and limit its achievement. Reasons for this can be found in different areas such as the general circumstances (external and internal for the organization), the transfer participants and the characteristics of the specific knowledge itself.

As barriers to knowledge transfer which arise from the external circumstances Liu (2007) identified constraints such as cultural and environmental differences and distance. He argues that these gaps restrict the co-operation and therefore derail the fruitful knowledge transfer. On the level of organizational circumstances many authors like Boisot (1995), Knudsen (2007) or Teece (2000) see the fear of losing intellectual property rights as the most important obstacle. Especially as an intellectual asset, the knowledge base, is one of the most valuable capitals of a company, which often ensures its competitiveness, companies tend to reveal knowledge as little as possible to outsiders. These outsiders can be external parties like other firms, research institutes or business partners, but also internal parties like co-workers. This may occur due to the fact that employees may fear to get unimportant if they share too much of their special knowledge within the company.

Another barrier to knowledge transfer emerging from the organization is the difficulty to measure the result of the transfer which may lead to the insecurity of the success expected from the invested efforts. Especially when it comes to knowledge transfer across the borders of an organization, when co-operations or alliances could be established, the management often fears the costs and efforts this brings, whereas the positive results are not guaranteed or cannot be seen directly.
Furthermore, the executing people may restrain the transfer of knowledge. The transmitter, as the sender of the information which should be transformed into knowledge, needs to have the ability to articulate his knowledge in an appropriate, understandable way so that the receiver can use the message. The transmitter may as well face a problem that the knowledge he wants to share is not perceived as something reliable and therefore the transfer becomes unsuccessful. The knowledge receiver on the other hand, has to have the capacity and the compatible understanding to absorb the knowledge. Both, transmitters as well as receivers, need to have the right motivation to share their knowledge. Only if they are willing and understand why it is important knowledge transfer can be expected.

The third group of obstacles towards knowledge transfer can be found in the specific characteristics of knowledge and especially, as discussed before, in the tacit part of knowledge as it is not easy to access, articulate and utilize. Not only its tacitness but also its complexity, unsecure reliability, individual codification, etc. increase the difficulty to transfer it successfully. Furthermore, Teece (2000) argues that “knowledge ... is of little value if not supplied to the right people at the right time” (p. 38). This implies the problem that the right knowledge base in the organization, if available, has to be identified and accessible when the need occurs. In bigger organizations, where the communication of each individual is not embracing the whole organization, this fast access is often problematic, due to a lack of information about where the right knowledge source can be found.

For the study on knowledge transfer in Science Parks these barriers are not a part of the main research issues, as the purpose of the study is to find enhancing factors rather than barriers. Nevertheless, it seemed to be reasonable that the absence of some common barriers in these co-operations would consequently enhance the knowledge transfer.

4.4. Science Parks as environment for co-operation
Additionally the study focuses on the structural arrangements which enhance knowledge transfer in Science Parks. Therefore, a more detailed look has to be taken at the composition of Science Parks. This comprises issues such as, the way we define and understand Science Parks and their purpose, characteristics of tenants and their motivation to co-operate, along with the main features of the co-operation. Additionally, the main characteristics of physical as well as social structures are investigated. This contributes to the clarification of our understanding of the topic when talking about co-operation within Science Parks.

4.4.1. Science Parks and their purpose
When talking about Science Parks it seems reasonable firstly to define what exactly the term Science Park means to us based on the literature reviewed. Moreover, along with ‘Science Parks’ other terms, such as ‘Business Park’, ‘Research Park’, ‘Technology Park’, etc., exist to describe similar establishments (Löfsten & Lindelöf, 2002). But as their characteristics can vary widely a clear differentiation is needed.

In the wide field of literature on Science Parks different definitions can be found and range
from quite broad to more specific. Hansson (2007) characterizes Science Parks in the following way:

A science park then is first of all characterized by its physical setting with buildings, laboratories, etc., combined with managerial support and with close access to a public research organization – often one with a research knowledge base in high tech or biotech. The combination of a particular physical location and a high level of technology or knowledge distinguishes science parks from a number of newer competitors like business parks, business incubators and innovation centres. (p. 355)

Hansson emphasizes the importance of a high standard technology or knowledge available in Science Parks to support the scientific research process. The International Association of Science Parks (IASP), a worldwide network of Science and Technology Parks with members in 77 countries, stresses its attention on knowledge and technology transfer as crucial factor for Science Parks in the following definition:

A Science Park stimulates and manages the flow of knowledge and technology amongst universities, R&D institutions, companies and markets; it facilitates the creation and growth of innovation-based companies through incubation and spin-off processes; and provides other value-added services together with high quality space and facilities. (IASP, 2002)

Link (2006) sees the starting point for Science Parks, in this case called 'University Research Parks', in his definition in the agglomeration of technology based firms which strive for benefit through the close connection with the university; and vice versa.

A university research park is a cluster of technology-based organizations that locate on or near a university campus in order to benefit from the university’s knowledge base and ongoing research. The university not only transfers knowledge but expects to develop knowledge more effectively given the association with the tenants in the research park. (p. 44)

Eventually, Science Parks are described by the United Kingdom Science Park Association through the use of following characteristics: (Löwegren, 2003, p. 11)

- Has formal and operational links with a university, other higher education institution or Research Center;
- Is designed to encourage the formation and growth of knowledge-based businesses and other organizations normally resident on site;
- Has a management function, which is actively engaged in the transfer of technology and business skills to the organizations on site. (Grayson, 1993)

For this thesis work the last definition corresponds to our understanding of the term ‘Science Park’ in the most appropriate way. Additionally, the emphasis of Link and IASP on knowledge and technology transfer, to stimulate research and innovation, as well as the supply of facilities and services through the Science Park comprise the most important factors.
Also when it comes to the expectations from Science Parks, the discussed objectives are broad. Löwegren (2003, p. 34) summarizes the following points:

According to recent research, Science Parks are most notably presumed to:

- promote Higher Educational Institution (HEI)/industry linkages and the transfer of technology from HEIs to Science Park firms;
- promote the formation of new technology-based firms;
- encourage spin-off firms started by academics;
- encourage the growth of existing technology-based firms;
- attract firms involved in leading-edge technologies;
- create synergy between firms;
- improve the performance of the local economy
- create new jobs directly as well as indirectly

These purposes may be differently emphasized in different Science Parks, but it seems to be most likely that their positive outcomes are widely appreciated in any Science Park and its environment and therefore it seems to be appropriate to accept them as generally valid.

### 4.4.2. Science Park tenants

In order to develop a better understanding of what happens within Science Parks it is interesting to look at which kinds of companies tend to become tenants and join Science Parks.

Throughout the reviewed literature ‘new technology-based firms’ (NTBF) are considered as the most attractive and interested partners for Science Park co-operations. Interesting to consider is the fact that the ‘new’ in this term can be understood in the sense of ‘new technology’ or as ‘new firm’. Löwegren (2003) argues that most firms in Science Parks are relatively new and small and therefore the ‘new’ is mainly related to the age of the firm. On the contrary, the result of a study of Braun and McHone (1992) shows that “firms located within parks were more often subsidiaries of large, publicly held companies attempting to expand their product lines and operations” (Lindelöf & Löffsten, 2002, p. 145) and thus, not anymore to be considered as ‘young’ but rather related to the field of ‘new technologies’. In our understanding there is no need to distinguish between different interpretations of ‘new’, as firms of both interpretations seem to be suitable to become tenants of Science Park. The crucial point is rather the interest in the knowledge provided by the research institute and the ‘innovative milieu’ (Löwegren, 2003) provided by a cluster of similar companies than the age of a company.

A second group of companies attracted by Science Parks is the new start-up-firms. With their high intensity of innovations and research, Science Parks attract and breed entrepreneurs and new business ideas and give them the chance to become reality. Often these so called ‘Incubators’ offer the possibility for small businesses to spend their first years under supported and favourable conditions. According to Westhead (1997) “Science Parks can provide the catalytic incubator environment for the transformation of ‘pure’
research into production” (Lindelöf & Löfsten, 2004, p. 312) and Löfsten et al. (2003) add that “technology incubators appear to provide an environment conducive to the development” (p. 52) of start-ups. These start-ups are often directly related to the attached research institute, as researchers, students or professionals try to commercialize their scientific ideas through the establishment and development of new businesses. Furthermore ordinary start-ups, not related to the research institute, join Science Parks with the aim to benefit from the innovative, favourable environment with specific support for start-up firms.

Moreover other firms, like big multinational companies are joining Science Parks as they also are aware of the possible advantages from this special environment. Through co-operating they can share the risk of their developments, shorten their development times and thus save costs. Therefore, big companies also participate and contribute to the stimulatory mixture within Science Parks. Additionally they search for new innovative stimulation away from their headquarters with new, fresh and more independent ideas. They are enhanced through the high availability and intensity of networking activities due to the direct interaction and availability of smart, auxiliary people within close proximity.

Thus, synergy effects in technology clusters can be utilized by every kind of company in Science Parks as long as they are open to co-operate and share parts of their knowledge. Nevertheless, new technology-based firms and start-ups are the major tenants as their needs are met in the best way.

4.4.3. Styles of co-operation between research institutes and companies

Even though, there are without a doubt many advantages of co-operating with one or more potential partners in a Science Park, according to De Witt et al. (2004) companies always face the paradox of competition and co-operation. “Firms constantly struggle with the tension created by the need to work together with others, while simultaneously needing to pursue their own interests.” (De Wit & Meyer, 2004, p. 369) This means, that companies on the one hand always have to follow their own goals which are more often than not mutually exclusive to different organizations and therefore determination in the own objectives is crucial to stay competitive. Weakness would lead to competitive advantages for competitors and therefore consequently to problems of the own organization. On the other hand, partnerships and other co-operations can be essential for the economic well-being of a company as it can ensure the competitive position through, for example, developing products together with suppliers, customers, or research institutes.

Thus, the participants as well as the structural arrangements of a Science Park are expected to ensure that both, the companies as well as the research institute can benefit from the co-operation. This collaboration is supposed to have positive effects on their business or interests and therefore attract the companies to join these partnerships.
Therefore, the co-operation between companies and research institutes can take different forms; from official research contracts to informal ones, as well as to the transfer of personnel between academia and industry. Formal agreements can take the form of research personnel involvement in consultancy work, joint research or contractual works on certain topics and provide with opportunities to utilize the available knowledge in an effective way. Nevertheless, according to Löwegren (2003) one can find these formal links only in a minor number of cases whereas informal linkages play a commanding role for co-operation. These can be personal contacts and networks which are activated through the spatial proximity, the access to, for example, university libraries, laboratories, and other premises or the attendance of education programmes and conferences organized by the educational institute.

A third point of contact between the research institute and companies with benefits for both sides could be established through linkages in the field of human resources. Through conducting projects for companies students can gain practical experience and support them on low costs. This gives companies the possibility to get to know potential future employees already during their education; and vice versa. The closeness to a University offers various possibilities to access graduates and other experienced scientists for the general recruitment. And finally, the education of the staff may be easier to realize effectively if a professional education institute is easily accessible.

4.4.4. Structural Arrangements within Science Parks

When Science Parks are looked upon in terms of their structural arrangements these structural arrangements are reflected in two different ways: through the social and physical structure of a Science Park. Even though none of the classic organizational schemes are fully applicable to a Science Park, it is still an organization which is physically present and possesses its own goals and objectives. Therefore the field of organization theory was carefully revised and such concepts as social and physical structure of a Science Park as an organization were considered to be reasonable to introduce within the scope of this study.

According to Hatch and Cunliffe (2006) the term structure refers to certain relationships among the parts of an organized whole. Organization theory scholars are particularly interested in two different types of structure – social and physical.

**Social Structure**

Social structure refers to the relationships among individuals who play certain formal or informal roles within an organization and to the organizational groups or units to which these individuals belong (e.g. departments, divisions) (Hatch & Cunliffe, 2006). Another important statement that Hatch and Cunliffe made is that “most theorists unquestioningly accepted social structure as a fact of organizational life and assumed it to be a significant determinate of both human behaviour and organizational performance” (2006, p. 101). Whereas within the context of a Science Park the main interest is concentrated on how its social structure affects human behaviour.
A Science Park cannot be viewed as an organization in the classical sense of the term since there is no product of its activities. Nevertheless, if one happens to be in search for a better understanding of the activities taking place within a Science Park it seems appropriate to look at it as an organization with its management where the managed are not individuals, but single companies. Furthermore, the main goal of the management is not to accomplish coordination and control, but increase the overall amount of communication, involvement and satisfaction which makes the successful knowledge transfer between the parties involved more likely.

Linking the statement above to theory one would be likely to conclude that an organic organization concept would be appropriate to apply for a Science Park. Organic structures, as opposed to mechanic ones, are characterized by: 1) low formalization (absence of formal obligations), 2) decentralization (freedom in decision making), 3) personal expertise and creativity without supervision, 4) frequent lateral communication, often in the form of consultation between people from different departments (Science Park tenants). (Hatch & Cunliffe, 2006)

By taking a step further into symbolic-interpretive approaches to social structure it seems quite useful to look at Science Parks in terms of two social practices: routine and improvisation. Where routines according to Feldman (2000) are flows of connected ideas, actions and outcomes that emerge as organizational members try to understand what to do in particular work contexts. Routines are constantly created and recreated while they are used in a wide variety of combinations and contexts. Karl Weick (1998) proposed viewing the organizational structure as “an emergent and unfolding process of routines and improvisations operating more like recipes than blueprints”. Therefore routines are undergoing constant change through improvisations. “Once institutionalised through constant repetition and widespread acceptance, an improvisation becomes routine.” (Hatch & Cunliffe, 2006, p. 128) Therefore the main objective of a Science Park can be seen from this perspective as an introduction of knowledge sharing and transferring ideas and activities through improvisation and converting them into routines.

The comparison made by Mary Jo Hatch (1993) between a jazz performance and organizational reality, where she identified coordination gaps within which the musicians as well as organization members are allowed to improvise on each other’s ideas until a unique playing is reached, allows one to assume that this improvisation technique is also applicable within Science Parks. Large coordination gaps exist among the Science Park tenants where the only thing that they are obliged to do is to pay the rent for the offices. Furthermore the management of Science Parks offers them great opportunities for sharing as well as improvising on each other’s ideas.

The concept of communities of practice introduced by Lave and Wenger (1991) is perceived by the authors of the present study to possess the most relevance to the concept of a Science Park as a knowledge generating and transferring entity. Community of practice is defined as
a group of individuals informally bound together by common interests and shared repertoires (e.g. routines, vocabularies). They are self-designing and self-managing and their common goal is mutual learning and the development of knowledge. Members of such communities are in a constant movement between different parts of a community and even between different communities in order to share and broker knowledge. Communities of practice are characterized by connections rather than hierarchical or formalized relationships and the manager’s role is one of integration rather than authority. Therefore Science Parks, taking into account their objectives and the character of the interpersonal as well as institutional interactions within them, allow to be looked at as communities of practice with the tenant companies being the members of these communities. Where tenant companies are represented by single individuals or groups of individuals who interact in the process of knowledge generation and transfer.

As Hatch and Cunliffe (2006, p. 101) mentioned: “social and spatial aspects of organizations are not completely separable; they overlap in the same sense that people have both physical bodies and social identities”, after having discussed the social structures relevant to Science Parks, at this point it seems reasonable to speculate around the concept of physical structure of an organization.

Physical structure

Physical structure refers to the spatial and temporal relationships between physical elements of an organization such as its buildings and their geographic locations (Hatch & Cunliffe, 2006). Physical presence and spatial location are necessary attributes for most of the modern organizations; therefore their physical structure should most likely not be disregarded. Physical structures make such phenomena as organizational culture and power more tangible. Nevertheless, just because the physical structures are tangible does not mean that the interpretations given to them are necessarily obvious.

Heinrich Klotz, former director of the German Architecture Museum in Frankfurt, explained how the physical structures and their importance were perceived by different generations (Hatch & Cunliffe, 2006, p. 238):

For many decades we were indifferent to the meanings of architectural forms, either because we were totally opposed to them or because we could afford to ignore them. The structural aspects of a building and the functional values in terms of cost economisation and optimisation of use were the main objects of interest. The fact that a form could mean one thing or another was not a topic of official discussions, and it remained outside the range of debatable questions for architectural theory. To consciously consider the form of architecture a vehicle of meaning was an exceptional thing to do. Whether architects like it or not, a building acts as a vehicle of meaning even if it is supposed to be meaningless. One way or another, it represents a visual aspect. Even the vulgar post-war functionalism that cut the characteristic features of a building to a minimum produced buildings that, as they entered one’s visual field, acquired a meaning: An apparently neutral and monotonous uniformity.
Hatch and Cunliffe (2006) identify the following elements of physical structure: organizational geography, layout, landscaping, design and decor.

“Organizational geography includes the locations and facilities owned and operated by the company as well as locations regularly visited by organization members, such as the facilities of customers, suppliers, partners or other influential stakeholders” (p. 227). Geographic location of a Science Park plays an extremely important role for its tenants and usually serves as one of the main reason for joining. Spatial proximity to existing as well as numerous potential customers, suppliers and partners along with the overall development level of the geographic region is an important factor for any company.

Layout refers to spatial arrangement of physical objects and human activities. Within a building layout involves the internal placement of objects, especially walls, large pieces of furniture, equipment and employees. Hatch and Cunliffe also emphasize such aspects of organizational layout as proximity, openness, accessibility and privacy. While proximity, openness, and accessibility contribute to the likelihood of the exchange of all kinds of information between the employees (Science Park tenants), privacy on the one hand decreases the possibility of a random chat, but on the other hand provokes face-to-face contacts, which facilitate the transfer of tacit knowledge.

A concept in office design which is worth looking at is known as hot desking, this means that there are no permanent working places whereas they are provided upon necessity (Hatch & Cunliffe, 2006). Since constant flow of ideas between Science Park tenants is appreciated, it would be a good idea if each tenant had at least one room or a desk available for temporary location of a coming colleague or a consultant. This would most likely increase the desired fluidity of personnel together with the precious knowledge within their heads.

Landscaping, design and decor refer to the artistic side of architecture and the decoration of organization’s buildings and grounds (facade, focal points, furnishings, lighting fixtures, ceiling and wall treatments, floor coverings, use of colour and form and countless other details). These features contribute to the aesthetic effect on the members of an organization as well as on the outsider and they may either provoke or prevent from certain thoughts or actions. Therefore it is important to keep in mind that it is the judgements of organization members and other stakeholders that matter in understanding the aesthetic effects of physical structure on the organization and the inhabitants of its spaces (Hatch & Cunliffe, 2006). Consequently airy architecture with relaxing warm colours which provoke communication and sharing of knowledge seem preferable within a Science Park.

Modernist physical structure theorists argue that, even though modern communication devices enable you to reach anybody at any location in the world within seconds, face-to-face interaction is considered superior. This makes such feature of physical structure as spatial proximity extremely important. Consequently it can be assumed that Science Parks,
which cannot be accused of lack spatial proximity, offer great facilities in terms of communication possibilities. When locations are close and equipment is shared relationships and the possible transfer of knowledge can form through spontaneous interactions. An interesting fact to mention is that in a ten-year long study of R&D organizations, Thomas Allen (1977) found that performance was increased by chance encounters between members of different project teams who shared washrooms, libraries, coffee machines and photocopy equipment.

Continuing the argument brought up by Heinrich Klotz the followers of the symbolic-interpretive perspective emphasize the communicative power of architecture. Winston Churchill once put it simple in a few words: “We shape our buildings and afterward our buildings shape us”. Therefore the communicative power of architecture has to be taken into account during the design of the physical structures of any organization. Moreover Hatch and Cunliffe warn that one should never assume that the intended meanings designers and executives use to create their architecture are the only meanings their designs allow. No one knows for sure what kind of physical structures facilitate knowledge transfer in the best way. Nevertheless, based on previous studies and experiences one may reasonably assume that certain type of physical arrangements contributes to the most face-to-face interactions together with spontaneous meetings thus increasing the transfer possibility of implicit as well as tacit knowledge.

Summarizing one can say that the closeness of research institute and companies in Science Parks offers an attractive environment for different types of businesses. Especially technology-based firms and start-ups tend to be members as well as large international firms establish departments in Science Parks in order to utilize the innovative and knowledge breeding atmosphere. Science Park tenants try to enhance their success through co-operation with each other along with sharing and transferring knowledge. Furthermore, the social and physical arrangements offered by Science Parks make them an interesting object to study.

4.5. Summary of the Concepts and Theories used
In summary, the results of this theory review, which reflects our theoretical background, give us the following pre-understanding on the knowledge transfer in Science Parks. The basis for knowledge transfer is the knowledge itself. We understand knowledge as complex, absorbed, coded information which is interpreted and internalized by a person, and in organizations it can be identified in almost everything connected to its business. This comprises people, products, coded information or the work itself. In order to complete the process of knowledge transfer successfully both parties should have the same understanding of the topic in order to accomplish a successful sense-making process. Thus, the knowledge generation from available information to internalized knowledge is a complex and individual process, which is strongly dependent on the personal characteristics of the knowledge receiver.
In order to manage the knowledge gained in an organization effectively, different strategies are possible, depending on the environment and the type of knowledge. In knowledge based organizations an appropriate management strategy would be the one which connects the advantages of codification, like the longevity of the stored information, and the personalization, like the important influence of tacit knowledge and personal skills. Furthermore, this study concentrates on knowledge transfer in Science Parks and on the conditions which support and enhance the knowledge transfer activities and their success. During this, certain barriers to knowledge transfer have to be taken into consideration and it is assumed to be possible to recognize the absence of some common barriers in Science Parks which, as a consequence enhance the knowledge transfer.

As ‘Science Park’ we identify a conglomeration of businesses with strong links to a higher education institute, coordinated by a management, which actively supports the technology and knowledge transfer and provides companies with facilities and services. This attracts mainly start-ups and new technology firms which expect benefits and synergies from the cluster of similar firms. These companies co-operate with each other and with the research institutes in different ways, through formal or informal linkages and through human resources based issues. Additionally, the social and physical structure influences the performance and the style of working in Science Parks. This study is basically focused on all of these issues as long they influence the knowledge transfer between the different parties.
5. The Empirical Study

This chapter provides the reader with a more detailed description of the actually conducted empirical study on knowledge transfer in Science Parks. In order to set the scene the environment of the studied Science Park Ideon, the Øresund Region is presented. This is followed by the disclosure of how the study was structured and of the focus the interviews were on. In order to introduce the objects of the study the researched Science Parks, companies and the involved interviewees are presented in more detail. Finally, certain limitations of the research are stated to reveal the constraints connected to this study.

5.1. The context of the study

Before providing the reader with the description of the actual case study it may seem reasonable to mention a certain amount of background information concerning the research target. This in order to reveal the reasoning used while choosing the case and to justify the strategy behind the choice of the study target.

Ideon Science Park was chosen as main target for the study. Ideon is a large Science Park in the southern Swedish city Lund and one of the crucial players within the Øresund Science Region. This region is a transnational region in southern Scandinavia located by the shores of the Øresund strait and connected by the Øresund Bridge. The western part is constituted by the Danish islands of Zealand, Lolland, Falster, Møn and Bornholm. The eastern part is located in Scania (Skåne), Sweden. The region has a population of close to 3.6 million and a population density of 171.3/km² according to the official Web site of the Øresund Region (2008).

Key industries in the Øresund region include biotechnology, pharmaceuticals and health; information technology and communications; food; tourism, culture and recreation; transport; building construction; and business and financial services. The region ranks third behind London and Paris in biotechnological and medical research. There are around 100 000 people employed in the region’s IT industry, predominantly located around Copenhagen and in the Malmö-Lund area. Additionally there are around 20 higher education institutions in the Region. (Garlick, Kresl, & Vaessen, 2006)

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<th>Technology transfer offices</th>
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<td>DTU, The Patent Office</td>
<td>LU Innovation</td>
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<tr>
<td>Research and Innovation office at The Royal Veterinary and Agricultural University</td>
<td>Malmö University</td>
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<td>Tech Trans Unit at University of Copenhagen</td>
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<td>Copenhagen Business School, Career Centre</td>
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<td>TechTrans Office. The Danish University of Pharmaceutical Sciences</td>
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<td>Roskilde University</td>
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Table 5.1: Innovation players in the Øresund Region

As can be seen from Table 5.1 the Øresund Region is a highly innovative and research intense area (Garlick, Kresl, & Vaessen, 2006, p. 31) due to the high number of knowledge generating institutions present in the area. Such organizations as technology transfer offices and Science Parks seem to serve as the indicators that the area is attractive for knowledge based firms.

Some of the largest R&D corporations in Europe have a presence in this Region. In 2003, Sweden spent 4.0% of its GDP on R&D, which is among the highest national R&D expenditure levels in the world. A very large part of the funding comes from Sweden's largest companies (such as AstraZeneca, Ericsson, Volvo, Saab, etc.), which account for three-quarters of the total sum. Parts of this private R&D money flows to the Swedish side of the Øresund Science Region, as many of these companies run operations in this area. The Øresund labour market has high levels of educational qualifications, which is expected considering the many higher education institutes in the region. (Garlick, Kresl, & Vaessen, 2006) Consequently, the Øresund Region is among the five top regions in Europe in relation to the production of scientific papers (Matthiessen & Wichmann, 2005). Furthermore, the region is not only a collective branding exercise taking advantage of the new fixed link, but actually has the potential to be a significant global motor built on science, innovation and enterprise (Garlick, Kresl, & Vaessen, 2006).

One of the most important characteristics of the Øresund Region is the creation and support of platforms as an intermediary between higher education and business and other stakeholders in the Øresund Science Region. This is a significant innovation in creating effective and meaningful dialogues between higher education institutes and regional stakeholders. (Garlick, Kresl, & Vaessen, 2006) As far as Skåne, the Swedish part of the Region, is concerned, it can be reasonably assumed to possess a tremendous knowledge generating capacity due to the fact that Lund University is one of the best regarded in Scandinavia and the fact that Malmö is constantly transforming from an industrial into a knowledge-based city.
Therefore, it seems most reasonable that when large amounts of valuable knowledge are generated a necessity to transfer it from the academia into the business world arises by itself. Science Parks presumably offer suitable conditions for companies and universities to share the knowledge between each other. Thus, Ideon Science Park as a part of this knowledge generating and fast developing area was studied.

5.2. The structure of the study
To get the needed insight into the operational sequences and the circumstances of Science Parks, a case study on Ideon was carried out. Ideon seems to be a suitable representative of Science Parks and can hopefully provide the needed knowledge and insight to examine the study in a proper way. This follows the Grounded Theory approach of Strauss where a theory is built on an empirical research (Strauss & Corbin, 1990). The Øresund Region is also a place of location of ‘The Medicon Valley’ which is a leading bi-national life science cluster in Europe and the largest in Scandinavia. Therefore Medeon Science Park which is focusing on companies involved in life science was also studied in terms of knowledge transfer.

Interviews with the management of Ideon and four strategically chosen companies within the Science Park were conducted. These companies are all playing a different role within Ideon and are described in more detail further in this chapter. Additionally, in order to avoid the trap of making generalizations based only on one object included in the study the management of Medeon Science Park in Malmö was also interviewed.

Basically the study was structured in the following way:

To get the needed understanding of the activities taking place at Ideon, it seemed reasonable to start with studying the formal structure of this organization and the companies involved. It had to be analysed how the co-operation is organized and in which way the partners work together to stimulate their innovation speed.

As the next step after having had the needed insight into the Science Park, it was possible to investigate in more detail the process of knowledge transfer. Building on the understanding of their co-operation, an interesting point is the question if there is equal knowledge transfer in both directions of the partnership or if one side can profit more from it. Here, the assumed constraints towards knowledge sharing of companies had to be reviewed.

Thirdly, following up the structural analyses of Ideon, the available structural arrangements affecting the knowledge transfer in a certain way were looked at. In particular the management activities of the Science Park, the physical premises and the co-operation between all participants were in the focus of the interviews.

The issues described above were implicitly approached through the asking of indirect questions during the interviews. This due to the fact that it is likely that the knowledge
transfer participants involved not only fail to be aware of the theoretical framework pursued during this study, but also fail to acknowledge their participation in the transfer of knowledge.

5.3. The content of the interviews
In order to maintain relative control over the interview content and process, keeping in mind the objective to stay focused on the topic and to discuss knowledge transfer from different perspectives it was decided to divide each interview into three logical parts concerning:

1. General environment within the targeted Science Parks
2. Knowledge Transfer within the Science Parks
3. Management activities which influence the transfer of knowledge

In the first part of an interview done with the management of the Science Parks questions such as the following were asked:

- Could you explain the basic structure of the Science Park and its mission?
- What are the basic goals of this Science Park?
- Can you describe the co-operation between the Science Park and the connected University in more detail?
- In which form does this cooperation usually take place?

In the second and the main part concerning all of the interviews conducted our emphasis was placed upon the following questions:

- How can the connections between companies and the university be described from your perspective? How intensive are these connections?
- Are there any formal rules for these connections?
- How would you describe the knowledge transfer between the companies within the Science Park and between the companies and the university?
- Which structural arrangements contribute to the enhancement of knowledge transfer the most?
- Is there something like a knowledge sharing culture in the Science Park? Is the Science Park management promoting it?
- Which role do the informal interactions play in terms of knowledge transfer?
- Could you extrapolate on the issue of barriers to knowledge transfer?

The third part of the interviews concerning the knowledge transfer management consisted basically of the following questions:

- Does the Science Park management actively support or stimulate the co-operation between employees of tenant companies and the university? Or among the companies?
Is any kind of control maintained over these activities?

How do you ensure, if at all, that knowledge is transferred from the companies to the university? Do you have any kind of measurement for this?

The interviews were conducted in a semi-structured way, and therefore not all of the outlined questions were explicitly asked due to the fact that an answer to them may have been given during the discussion of other connected issues. More specific and unplanned questions arose naturally deriving from the discussions of certain topics which we believed needed a more detailed description and explanation.

5.4. The studied Science Parks

Two Science Parks were included in the research. Ideon Science Park was studied as the main object and Medeon Science Park was chosen as a secondary object in order to add more transferability to the study and avoid the hazard of generalizing on only one empirical sample. Even though the Science Parks come both from the same geographical area they differ from each other considerably. This gives the study the opportunity to view the topic of knowledge transfer in Science Parks from different angles.

- **Ideon Science Park**

Ideon Science Park, located in the southern Swedish city of Lund, is the oldest Science Park in Scandinavia and the biggest in Sweden when it comes to the amount of office space lent to companies. Established in 1983 and contemporary hosting over 250 firms with approximately 3,000 employees, Ideon plays an important role among the Scandinavian Science Parks. It accommodates high-tech companies of a broad variety however the majority comes from the fields of IT and biotech. (Sätherström, 2008)

Within Ideon one also can find an incubator, called Ideon Innovation, which offers favourable conditions for growth and development to new start-up companies. In April 2008 Ideon Innovation is hosting around 25 start-up firms and supplies them with a number of services, such as consultancy, networking and the organization of formal as well as informal social meetings.

One of characteristics of Science Parks is the proximity to a higher education institute. In the case of Ideon Science Park this institute is Lund University which is one of the oldest and biggest Universities in Sweden. In around 160 programmes and over 1.600 single subject courses, approximately 39.000 students gain knowledge and participate in the knowledge transfer and generation taking place within the university. (Lund University, 2008) Especially the Lund Institute of Technology has close connections to Ideon and is involved in many knowledge sharing activities, such as research co-operations, thesis works, consultancy or through people who are working for the university and a company at the same time.

Through the described characteristics Ideon serves as a suitable case for our study on knowledge transfer in Science Parks. With its size, the variety of companies and a large
The empirical study

University within close proximity it seems most reasonable that Ideon can reveal the features which knowledge transfer is characterized by.

In order to get a sufficient insight into Ideon and the processes within it an interview was conducted with the management of Ideon Center AB, the operator company of the Science Park. Namely these were Maria Sätherström, Marketing Director with a background in biotech and marketing and Thomas Carlsson, Project Leader and lately responsible for the resource companies in Ideon. They commented on their experiences and knowledge about Ideon during the interview. Through their central positions and far-reaching network at Ideon they possess valuable knowledge as far as the activities going on within the Science Park are concerned and therefore were strategically chosen as interviewees for this study.

**Medeon Science Park**

In order to have a second sample and a different perspective on knowledge transfer in Science Parks, Medeon Science Park was also included in the series of interviews. Medeon Science Park is situated in the centre of Malmö and therefore in the heart of the Øresund Region. It is specialized in the field of life sciences and hosts contemporary about 30 biotech, pharmacy, med-tech and health-care companies with approximately 400 employees all together. Medeon was started in the middle of the 1980's and is operated by Medeon AB which is a public owned, non-profit organization. Its main goal is to provide favourable conditions for life science companies, in order to promote growth and development which enhance the qualitative level and the competitiveness of the life science companies in the region.

Within the Science Park new start-up firms have the opportunity to grow and develop in the so-called ‘Medeon Inkubator’. There, promising new enterprises benefit from financial support, consultancy through an experienced business developer and other services offered by Medeon.

Medeon is related to the University of Malmö, and especially to the University Hospital. Malmö University has approximately 21,000 students and 200 researchers with the possibility and interest to generate and share their knowledge with the tenant companies.

As the main object of the study is the comparatively larger and more diverse Science Park Ideon, Medeon offers a different perspective on knowledge transfer in Science Parks. The considerable difference in terms of size, number of companies and employees within these two Science Parks is likely to influence the way the transfer of knowledge takes place and therefore improves the overall quality of our conclusions.

The interview was conducted with two representatives of the Medeon management: Catrine Pauckstadt, Marketing Coordinator who is in charge of communication issues and Åsa Lundgren, Project Leader who is the one responsible for Medeon Inkubator. By means of their positions they are involved in many processes going on within Medeon and therefore
presumably possess considerable amounts of valuable information about the knowledge transfer in it.

5.5. The studied companies
In order to get insights into the procedures going on in Science Parks some companies within Ideon were strategically chosen to be interviewed. Ericsson and BitSim were chosen as representatives of two groups, which are large and small tenant firms. The perspective of a service company transferring knowledge into the tenant firms on behalf of the Science Parks is represented by Teknopol whereas the connection and the perspective of the university is evaluated by LU Innovations, a department of Lund University.

✓ Ericsson AB
Ericsson AB, a Swedish-based provider of telecommunication and data communication systems, was one of the first companies joining the Ideon Science Park in 1983. Contemporary the ‘Ericsson Mobile Platforms’ department is located within Ideon and concentrates exclusively on research and development of mobile platforms for different types of mobile devices; for example mobile phones and portable computers. Currently Ericsson employs around 600 people in its Ideon department and is therefore one of the biggest companies within this Science Park. Through this considerable size Ericsson takes an interesting position in the Science Park environment and is consequently an attractive object to study. Additionally the focus on R&D, a mainly knowledge based work, gives good opportunities to examine the issue of knowledge transfer within it in reasonable depth.

The interview was conducted with Johanna Thorvaldsdotter, an HR representative who is in charge of staffing and student relations. Through her central position with connections to different departments of the company she has a good overview of the activities taking place at Ericsson and was able to contribute to the study with interesting information.

✓ BitSim AB
With only 10 people working in the local office BitSim plays a quite different role at Ideon. This Stockholm-based consultancy company is specialized in the fields of hardware development and microelectronics and conducts business mainly with companies within Science Parks. Beside its office at Ideon departments in Stockholm, Gothenburg, Linköping, Uppsala and Växjö were also established to be as close as possible to the customers and therefore to satisfy the customer demands in the best way.

This location in different Science Parks may serve as a suitable example of how companies can utilize the advantages which Science Parks offer for business development. Furthermore as a consultancy firm BitSim consequently provides mainly knowledge to its customers and is therefore sharing and transferring its knowledge in the everyday work. These characteristics make BitSim a valuable company to consider for the research.
For BitSim Leif Jespersson was available for an interview and represented the perspective of a small company inside a Science Park. He, as the head of the Ideon-office and the one responsible for the consultant coordination, is the key person in BitSim when it comes to selecting people to optimize the knowledge transfer and therefore seems to be adequate to consult about knowledge transfer in Science Parks.

✓ Teknopol AB

In order to have another perspective of one of the service companies, supplying the Science Park members with knowledge and services, Teknopol AB was included as an object in the series of interviews. Teknopol is a public funded company owned by Innovationsbron South, Region Skåne and ALMI Skåne and is specialised in the business development of high-tech, early stage enterprises with considerable business and growth potential.

As the main service provider for young ventures in the south of Sweden, Teknopol organizes many different network activities to connect the companies to each other so that established and experienced firms can help them to grow and become successful players in the market. Additionally, Teknopol employs business developers who work directly with the entrepreneurial companies to give them valuable advice on how to be successful. Through the nature of their work, to give advice and develop management skills in people, the transfer of knowledge is essential for the accomplishment of Teknopol's mission “to facilitate the creation of more successful growth-oriented companies in the industries of Life Science, Food, ICT, Cleantech and Technology.” (Teknopol AB, 2008)

Petronella Warg, responsible for communications at ‘Cleantech Inkubator’, one of Teknopol’s networks, provided information about Teknopol and the way the knowledge transfer is seen from their perspective. ‘Cleantech Inkubator’ is a virtual incubator and connects 14 companies from the area of clean technology. These companies are located in and off Science Parks and, therefore the interviewee seemed to be suitable for the evaluation of the knowledge transfer processes within this network. Furthermore she offered interesting information about the differences between the tenants and off Science Park firms in terms of knowledge transfer.

✓ LU Innovation

As mentioned above, Ideon has a close connection to the University of Lund and in particular the Lund Institute of Technology. Considerable amounts of research are done within it and consequently numerous new and valuable ideas are developed. In order to facilitate the commercialisation of these ideas developed within the university, LU Innovation was established. This constitution supports students or employees of the university in starting their own business or, if there is no interest in being an entrepreneur, just to protect their intellectual properties rights. This is done mainly through networking activities, such as building connections between the new venture entrepreneurs and
incubators who can supply them with a favourable environment or through direct advice on how to cope with the challenges of protecting and commercializing ideas.

LU Innovation contributes suitably to the study through the fact that the perspective of the university on knowledge transfer with Science Parks is covered. Therefore an interview with Helena Ljusberg-Wahren from LU Innovation was conducted. She is a Senior Adviser with long working experience in co-operation with and inside of Science Parks. Her experience and the broad network of contacts within the university and the business world give her the possibility to support entrepreneurs with high efficiency. Consequently, her experience and her understanding of the processes within and towards Science Parks make her an interesting contributor to our study.

5.6. Limitations of the Research
As this empirical study was conducted by students for a Master’s Thesis, naturally some limitations restricted the comprehensiveness and the quality of the research.

Firstly, one of the likely limitations would be the one that both researchers lack previous experience of working or studying within Science Parks. However, this absence of previous experience also insured the authors from biased pre-conclusions. Another limitation connected to previous experience of the researchers would be the fact that none of them had conducted an interview before. Therefore it is likely that even better and more precise information would have been gathered if the interviews were conducted by professionals. This was even more intensified through a lack of available time and sufficient funding which resulted in a limited choice of case studies and interviews.

Furthermore, the research was limited by the reluctance to cooperate of the companies involved in Science Parks. This resulted in the fact that the interviews had to be conducted with the companies that agreed to do it, and therefore not all companies in scope were gained access to.

As far as the actually carried out interviews are concerned some of the participants were surprised to discover not only the existence of knowledge transfer issues in their business environment, but also the fact that they are actually involved in it. Therefore, their answers might have been imprecise.

Moreover, people tend to overestimate the results of their achievements and to present themselves and their work in a more positive way than it is in reality. Consequently and not surprisingly the administration members of the investigated Science Parks were trying occasionally to commercialise the idea behind their Science Parks and promote the services that they offer. In this sense it was a wise idea from the researcher's side to ask the participating companies and the outsiders to evaluate the actions of Science Parks’ administration as far as the knowledge transfer between companies and the university is concerned.
6. The findings of the Study

This chapter presents the findings and results of the study on knowledge transfer in Science Parks. Through studying official information, gathering data and conducting interviews with employees of the companies involved in this study and the management of two Science Parks we were able to draw conclusions concerning the research questions discussed above. This comprises such issues as the way knowledge transfer in Science Parks takes place, structural arrangements which support the transfer of knowledge, how the knowledge transfer is facilitated by the Science Park management and finally common barriers to knowledge transfer occurring in Science Parks.

The presented findings are conclusions based on the gathered information made by us and therefore represent our view on the topic. As all Science Parks do not operate in a similar way it is difficult to generalize on the basis of one case which is Ideon. Nevertheless, through the inclusion of Medeon as a second sample, and our reasoning ability based on theoretical as well as practical information received, it is tried to present results which may be applicable in numerous cases.

The focus of the study is on Science Parks in general and therefore the emphasis is placed upon all institutions within Science Parks, even though some of them may be autonomous elements. For example the incubators in both investigated Science Parks are independent organizations with their own management and knowledge transfer enhancing activities, but still located in the Science Park and therefore also utilizing and contributing to the Science Park environment.

6.1. How Knowledge Transfer takes place in Science Parks

The first point of detailed investigation was the question how the transfer of knowledge in Science Parks actually takes place. Rather than one clear, definite manner we recognised various ways used by the co-operating partners to share their knowledge. The basis for this is interpersonal contact and communication via different channels. As it was discussed before the most valuable sources of knowledge can be found in the minds of people. Therefore, only if people know, meet and communicate with each other, the transfer of knowledge can take place. This interaction, which we see as the main trigger for knowledge sharing activities, was mainly recognized in three different combinations, which can be summarized as the followed:

6.1.1. Within Companies

One of the contexts where knowledge transfer takes place is internal for companies. ‘Internal’ in this term means, within the borders of a company-department and between different departments of one company. This could be for example the R&D department located in the Science Park and the head-quarters somewhere outside of the park. Irrespective of a company’s location, inside or outside a Science Park, each has its own
corporate culture and, hence its own rules and habits for internal communication. As these routines of communication strongly influence the knowledge transfer, the internal knowledge transfer seems to be less influenced by the Science Park environment. Nevertheless, as at least one part of the company is located in the Science Park, this provides reasons to assume that the environment influences its behaviour. Warg (2008) recognised a ‘knowledge sharing culture’ in Ideon and emphasised the “strong spirit of helping each other” as long as it doesn’t include direct competitors. Moreover Ljusberg-Wahren felt that the university environment influences the willingness of people to share their knowledge in a positive way. Therefore it seems most reasonable, that even though every company has its own culture, the environment affects it in a way that provokes knowledge transfer positively.

As results of the study the authors recognized the following points as the most common ways for internal knowledge transfer:

✓ Informal Communication

The informal communication between employees is one possibility for knowledge transfer within companies. As mentioned above communication is an important key for successful knowledge transfer. It takes place in organizations often in a formal, structured and sometimes specifically managed way. However, the informal dimension of communication is also important and takes place in such ways as spontaneous conversations in corridors, short discussions during coffee breaks or during regular work. Sätherström (2008) points out, that in companies, for example, the fact of sharing a coffee machine contributes to a greater amount of random meetings and consequently supports the communication and knowledge sharing activities. To which extend this spontaneous communication takes place in organizations, however, is highly dependent on the corporate culture of the companies. This corporate culture can vary for different companies tremendously but we, as the authors of the present, research doubt that there is an organization where the knowledge transfer is eliminated through the total absence of informal communication activities.

✓ Planned Training sessions

The knowledge transfer is carried out in a more formal way within the companies when planned training sessions are held. In such events experienced members of the organization try to share and transfer their expertise on a certain topic to their colleagues. This happens during Seminars, practical mentoring sessions or similar activities. Especially for companies where more people work on similar issues and therefore need analogous knowledge, positive effects on the productivity are likely. For example Jespersson (2008) reported that BitSim uses such training courses for internal purpose quite satisfactory to spread their specific knowledge within the company.
Nevertheless it seems that this way of sharing and transferring knowledge still has room for improvement as the employees’ often appearing lack of time more often than not hinders such activities from taking place. In these situations either the corporate culture or the attitudes of the employees do not support the knowledge sharing activities strongly enough and therefore they do not recognize the potential for better development.

However, planned training sessions and similar activities take place within the examined companies and thus, they are likely to be perceived as one of the knowledge transfer enhancing activities within Science Park tenants.

**Personnel Rotation**

Thirdly, one of the most effective ways of transferring knowledge within a company seems to be the transfer of personnel between different departments. This means their frequent change of either position or location within companies which brings new knowledge into different departments. According to Jespersson (2008) the communication is stimulated, when these new employees with certain experience change their working environment and start working with new colleagues. Especially in the first few months, the employees have increased interest in the knowledge and experiences, their new fellow workers gained in other parts of the company and therefore the knowledge transfer is stimulated.

Another factor concerning the enhanced knowledge transfer through personnel rotation is the social networking issue. Everybody possesses its own network of contacts and retains it when changing the workplace. Especially in Science Parks it is likely that people get new business contacts easier and more frequently as the personal interaction with new people occurs more often (Pauckstadt, 2008). Therefore, when employees change their working environment within a company they often can offer several new contacts to their colleagues in case that they need special assistance or are interested in special knowledge they may not possess. Through this people get connected and may start the exchange of information and therefore stimulate the knowledge transfer.

Each of these three points is seen to possess great value by the Science Park tenants. They all emphasized the importance of knowledge transfer within their company and of crossing the boarders of the own department to spread the knowledge in the best possible way within the whole company. However they see the importance, their own expectations seem to be often underachieved. As Jespersson (2008) put it aptly: “We are trying to share the knowledge within the company but we are just too busy.” Hence, there is much room for improvement for the companies and the main area requiring improvement seems to be the attitude towards and the active support of internal communication and knowledge sharing to improve the knowledge transfer.
The Science Park management naturally also favours and promotes success-stories of their tenant companies and therefore has an interest that they utilize every improvement possibility as effectively as possible. However, as Sätherström (2008) explained, “we can only offer the environment. The companies are responsible for their own activities.”

Eventually, we see the internal knowledge transfer of companies as something essential for the sustainable success of an organization. Employees join but also leave organizations and each time they take their knowledge with them. Therefore it is the knowledge transfer between employees as well as between different departments that is essential to avoid the loss of this knowledge and to be able to augment it. In Science Parks it does not seem that the companies are highly aware of these issues, but it is doubtable that this differentiates them from off Science Park firms. The above described activities are certainly valuable, however, the companies often lack initiative and proactive activities to accomplish knowledge transfer successfully. The reason behind this lack of awareness as well as proactive behaviour could be the fact that most of the time knowledge transfer issues are not explicitly articulated by the companies’ management. Therefore, in order to overcome this barrier, it might be a reasonable idea to introduce a person responsible for handling these knowledge management related issues within the company. However, if this requires too many resources, to enrich the everyday tasks of the employees taking into account their influence on knowledge transfer.

6.1.2 Between Companies and University

The second form of co-operations taking place in Science Parks is the one between tenant companies and the related university. Here the Science Parks show their advantages through the connection to higher education institutes which is much established much easier in this environment than it would be when located outside a park. These connections are usually characterized through mutual knowledge transfer as both sides, companies and Universities, benefit from them under the condition that co-operation is happening.

The study identified the following ways of collaboration exercised in Science Parks:

- **Student involvement in businesses**
  
  The first to mention is the direct involvement of students in the businesses conducted by the companies. This frequently takes the form of practical thesis-works, where students are hired by companies to conduct research within the area of the company’s particular interest. This gives students the opportunity to gain highly valuable practical experience and new knowledge within the area of their speciality. Additionally the company benefits from fresh, independent ideas which were nurtured in the academic world where latest research developments take place. Thus, the students contribute to the development of the businesses and at the same time gain extremely useful knowledge. This is also the case in similar situations when students are involved in project works, focus-groups, discussions, or other events where the companies search for the direct contact with students.
It is most likely that the transfer of knowledge is happening within the context of these co-operations quite successfully due to high motivation of the students as well as the companies which have a high interest in getting as much as possible out of these co-operations.

**Issue-oriented discussions**

Wide variety of research is usually conducted within large universities and simultaneously a high number of Science Park tenants are research and development based companies. Through this coexistence it seems most reasonable that there are frequent cases where companies and university work on similar issues which lead to co-operation or exchange of opinions. Actually this takes place in different occasions where researchers from the university or companies search for contacts in order to increase the chances of getting new knowledge on their field of expertise through fruitful discussions.

However, there is no certainty for success and Jespersson’s (2008) comment that they “have discussions with professors who research in the same area” and they “hope to get something out of this” shows the doubt companies still have about co-operations like this. But even though there is no assurance for success, experience shows that the invested time is seldom wasted.

The exchange of ideas and knowledge with people within the same research area but with no conflicts of interest are seen as one of the most valuable activities concerning the knowledge transfer in Science Parks.

**Mutual involvement of employees**

A third point of contact for a University and Science Park firms is the mutual employment of people. Ericsson for example, the largest tenant of Ideon Science Park, has a strong link to the University of Lund through people who are simultaneously employed by Ericsson as well as the university. These People work part-time in each organization and therefore automatically transfer knowledge between both institutes. This is for the benefit of both organizations as they do not necessarily have to stimulate this knowledge transfer actively but already get something through the two-sided employment. The extent to which the organizations benefit from this, in turn mainly depends on the employee himself and his attitude towards knowledge sharing and transfer from one organization to another. This, of course is often restricted by formal rules to protect the corporate secrets of organizations, nevertheless the parts of the tacit knowledge that individuals possess get transferred unconsciously.

**Commercialization of business ideas**

Another opportunity for knowledge transfer in Science Parks including companies and university is utilized when ideas or inventions, developed in the university environment, become commercialized by companies within the Science Park.
Frequently researchers make some breakthroughs in their research but are not able or just not interested in their commercialization. In these situations, organizations such as LU Innovation, a department of the University of Lund with strong connections to Ideon, bring the researchers together with interested companies and support them in transferring the knowledge. Thereafter the company has the rights and the abilities to use the inventions. However, most of the time, the researcher from the university is included in the commercialization with some interests in the product’s success.

Moreover, these researchers also ask for direct support if they want to build a business around their ideas. Through different institutions, such as LU Innovation or Science Park incubators, they get provided with consultancy and support on how to become successful. Especially during the initial stages of these new businesses a large amount of knowledge is often transferred to the new business owners, as in the beginning of their business career their learning curve is still steep and hence they can absorb most of the new knowledge.

**Direct collaboration**

The last form of knowledge transfer to mention is the direct collaboration between researchers coming from companies and the university. This collaboration takes palace in two different, but both highly effective ways.

Firstly, researchers from companies and the university come together not only to discuss issues related to their specific problems but they work together to bring the research and the development onto another qualitative level. They share offices and laboratories and thus, through this intensive contact, highly favourable circumstances for knowledge transfer are generated. These collaborations are often organized for a limited time or for the accomplishment of certain projects. This enhances the motivation to generate new, valuable knowledge effectively and therefore the sharing and transferring process is stimulated.

The second opportunity to co-operate in a direct way is the setting up of new institutions which are ran by companies and the university together. This for example happens at Ideon where the large companies SonyEricsson, Ericsson, Axis and TAT, united in the ‘Mobile Heights Competence Network’ together with the Lund Institute of Technology founded three research centres to make their research more efficient and successful. Here the combination of academic and business world knowledge gathered in a knowledge sharing environment, the research centre, most likely offers multiple opportunities for successful knowledge transfer.

In general this co-operation between companies and the university in Science Parks is taking place with a quite different set of characteristics. Some companies utilize the possibilities frequently, whereas other Science Park tenants have no connections at all.
Nevertheless, most of the companies see the opportunities that the knowledge exchange with the university could offer but they miss to take the initiative and to set up a connection.

Moreover, the management of the Science Parks seems to be unsure of how intensive this collaboration takes place in reality. At Medeon as well as Ideon the management described the initiation and maintenance of relations as a difficult process which is desirable but not easily accomplished. They see the main advantage of the connection between the university and the Science Park mostly in the possibility to commercialize the research done in the university. And this is also the most common relation between these two organizations. At Ideon, for example according to Sätherström (2008) approximately 70% of the companies have their roots in the university.

Concluding one can say that both organizations, the Science Park tenants as well as the attached university, could get much more out of this co-operation than they actually do at the moment. Some very successful examples can be found but in general it seems that it is usually the companies which hesitate to search for suitable co-operation possibilities.

Moreover, the Universities seem to have quite low awareness of the benefits they could get out of collaborations, because hardly any initiatives concerning knowledge transfer were recognized during the study. The only touch point where the initiative comes noticeable from the university is the student placements in companies to accomplish practical work for their studies. A possible reason behind this could be the fact that currently only a small number of tenant companies are involved in a fruitful and beneficial cooperation with the universities. Through this less best-practice examples are available to emphasize the advantages and value of these co-operations. Additionally the knowledge generated within universities is mainly of theoretical nature and, therefore, the employees as well as the management of tenant companies, who are usually specialists within a narrow area of expertise, may not be able to recognize its practical value. Thus, some well commencements are done but there is still much room for improvement to develop the co-operations between university and Science Park.

6.1.3. Between Science Park tenants
The third and most intensive way knowledge transfer in Science Parks takes place is the direct collaboration and interaction among the Science Park firms. This happens through co-operation, through consultancy on commercial basis as well as on behalf of the Science Park management. Additionally informal and formal exchange of ideas and support is facilitated through the conditions Science Parks offer. These conditions are examined in more detail in a further part of this study, whereas here are presented the four chosen ways of knowledge transfer among companies.

✓ Business Co-operation
  According to the before presented concepts of Science Parks, one objective is “to encourage the formation and growth of knowledge-based businesses” (Löwegren,
through the direct co-operation with the high number of companies around them. This cluster of generally similar companies brings together a high number of potential partners with the possibility of business or research co-operations. According to our observations these co-operations actually take place. Companies use the similarity of their research areas to build jointly financed and staffed research centres. Moreover, they naturally work together on regular business level as customers and suppliers of their products. An example of a research co-operation was already mentioned before with the 'Mobile Heights Competence Network’ where large in size Science Park tenants like Ericsson and Axis work together on relevant research issues. Ericsson is also involved in common business relations as supplier of hardware elements for other Science Park firms.

In both of these co-operations the knowledge transfer is an important element of the relationship. The researchers develop and learn from each other through the mutual interaction and also a modern business relation, especially when it comes to high-tech products, is based on the overlapping understanding of the technologies used. Thus, these collaborations only work successfully if knowledge is shared and transferred.

Furthermore, through the direct contact of the people and their interaction, it is likely that not only explicit knowledge is transferred but also tacit knowledge. The persons can observe the way of working and the reasoning behind of each other and hence, also gain knowledge which might have been not revealed yet.

**Consultancy on commercial basis**

Another form of co-operation is consultancy on commercial basis. Here, consultancy firms offer their experience and knowledge to support firms in dealing with modern business challenges or developing their businesses successfully. Science Parks therefore provide favourable conditions. Through the clustering of similar companies, consultancy firms can, within certain rules, work with similar companies at the same time and therefore enhance their knowledge in this area to the benefit for all of them. Also larger consultancy firms open offices within Science Parks in order to be close to their customers and to be able to transfer their knowledge most effectively, which is their main goal when hired by a company (Jespersson, 2008).

Education is another field where knowledge is transferred from one company to another. Consultancy companies, for instance, whose business is characterized through knowledge transfer, organize training courses for interested customers. The Science Park environment facilitates these courses in the important way as the face-to-face communication within the Science Park works fast to promote interesting courses. Consequently, the availability of useful educational programmes for companies is spread faster and the potential knowledge transfer is facilitated.
 ✓ **Consultancy on behalf of the Science Park management**

The experience of others is also utilized when consultancy services are offered on free basis to the Science Park tenants. Seminars, for example are frequently used to share and spread knowledge valuable and relevant for the others. These seminars are often organized by the Science Park management or larger companies to enhance the knowledge of the participants on a certain topic. At Ideon, as an illustration, seminars are held quite successfully with the purpose of sensitizing computer specialists to sales issues in order to understand and meet their customers’ needs better.

Specific to the incubators, the forcing ground for new start-up companies within Science Parks, consultants work on behalf of the Science Park and support the new ventures to grow and develop their company into a successful business. These services are usually free of charge and serve exclusively to transfer knowledge from highly to less experienced individuals in order to provide them with the needed knowledge. These business consultants, for example, often support entrepreneurs who possess purely technical background with the goal that they are able to successfully handle most of the arising business issues.

 ✓ **Mutual exchange of ideas and knowledge**

The last but not least recognized way of knowledge transfer among Science Park tenants is based upon the humans’ natural willingness to share and transfer knowledge. Every person, independently of his or her position or organization possesses special knowledge which may be valuable for colleagues and other people working in the Science Park. People certainly do not see sharing knowledge with everyone around them as their task. However, parts of it are often revealed either consciously or unconsciously during social interactions. Therefore, the environment of Science Parks with its number and variety of people as well as facilities provokes social interactions and hence the transfer of knowledge. This mutual exchange of ideas and knowledge happens frequently in shared facilities such as restaurants or cafes as well as corridors, in elevators or everywhere where people spontaneously meet each other. For example, the offices of Ideon tenants are located close to each other and thus informal communication is likely to happen.

A more formal but still voluntary form of interaction and knowledge sharing, for example, takes place in the incubators of the Science Parks. There, weekly meetings are organized where incubator firms present their own work, ideas and actual challenges to other tenants. On the one hand this gives the presenting companies the chance to view the issues that they are presenting from different perspectives, get tips and tricks on how to cope with certain situations and get challenged by the listeners through tricky questions. On the other hand the attending people get a chance to learn about the others’ businesses, gain know-how on how to deal with
certain situations and to broaden their horizon concerning different business issues. These meetings seem to be a highly fruitful occasion where knowledge is not only shared but new knowledge is also generated through the mutual exchange of experiences and know-how.

On the whole, the knowledge transfer among Science Park companies is taking place frequently and in various forms. Many of the companies are taking part in these co-operations and quite a number even builds its business on the transfer of knowledge to other companies. Jespersson (2008) puts it this way: “It happens frequently that we meet other people as you know who works on certain topics and who you have to talk to if you have a question.” Furthermore, we recognized a mutual consent on the usefulness of co-operating with each other and transferring knowledge as long as it doesn’t harm the competitiveness.

The Science Park management also emphasized knowledge transfer and co-operation as an important factor of success for Science Park tenants. Irrespective of whether they are using the knowledge transfer possibilities offered by the Science Park or not, the Science Park supports these activities as great chances for business success are seen in it.

Even though companies and Science Park management see the positive aspects of co-operating and sharing their knowledge, still much room for improvement is given. Far not all companies participate in the co-operation or find suitable collaboration partners. This might be due to existing barriers towards knowledge transfer, such as lack of resources as well as lack of experience in sharing knowledge, which are discussed further in this study. The offers and events of the Science Park are also utilized only by a minor number of companies. For example Ericsson as the large player in Ideon, according to Thorvaldsdotter (2008) has “not so much co-operation with other companies. We are quite much on our own here.”

Eventually, as summarized in the following Figure 6.1, the knowledge transfer in Science Parks is without any doubt taking place in various ways and intensities. However, there is ground to reasonably assume that these opportunities could be exploited to a much higher extent.
After having discussed the way how knowledge transfer actually takes place in Science Parks, it seems reasonable to reflect upon the environment within which it happens. Consequently, this section of the findings concentrates on structural arrangements which support knowledge transfer in Science Parks. As the behaviour of people is strongly influenced by the environment they are put in, it is most likely that the characteristics of a Science Park environment influence the knowledge transfer activities of the people as well. Two aspects of structural arrangements which influence the knowledge transfer within Science Parks were recognized during the research. These are the social and the physical structure, which are evaluated in detail in the following section of the study.

6.2.1. Social structure
Social structure is a necessary and important aspect for any organization. It influences the activities of a company in a certain way. The way the rights and responsibilities are assigned to different participants of an organization may affect the knowledge transfer in either positive or negative ways. That is why it is important to look at Science Parks in terms of their social structures.

The social structure of Ideon corresponds to most of the characteristics of an organic one outlined in the theoretical part of this study. While there is the formal management at this Science Park, it does not possess any formal authority over the tenant companies. The only thing that the companies are obliged to do is to pay the rent for the office space. Therefore
Ideon is a completely decentralized organization. This contributes to the great amount of communication, involvement and satisfaction among the tenants which happens to be one of the main goals of the Science Parks under scrutiny.

Nevertheless, the fact that the management does not possess any authority does not mean that they play a passive role in the activities of the Science Park. Instead, what they do is make sure that the tenant companies are assisted in the best way possible and the communication among them and between them and the university is promoted in the best way. Therefore, Science Parks are driven by different objectives. For example the main purpose of Ideon as a non-profit organization is to “help companies make as good business as possible” (Sätherström, 2008) whereas the vision of Medeon concentrates on offering “the most inspiring environment for life-science companies” (Medeon AB, 2008). What lies behind these objectives is actually their interest in the great performance of Science Park tenants, which may derive from successful knowledge transfer facilitated by the Science Park environment.

After having visited the Science Parks and conducted numerous interviews it can be concluded that the Science Parks involved and most likely Science Parks in general happen to be communities of practice, where people share ideas and knowledge which allow them to develop new practices as they learn together. These practices allow them later to become more competitive in whatever activities they are involved.

6.2.2. Physical Structure

No matter how abstract the concept of a Science Park may be it is still a physical entity which is present in space and therefore its physical structure presumably shall not be disregarded. Physical properties of different phenomena often determine their important characteristics. Therefore it was decided to look upon Science Parks in terms of their physical properties. Such aspects as geographic location, design, layout, spatial proximity were recognized to possess certain effects on knowledge transfer in Science Parks.

- **Geographic location**

  When looked at in terms of organizational geography Science Parks generally are not randomly positioned in terms of spatial location. They are purposely put in highly developed areas with proximity to a research cluster such as a higher education institute or an independent research organization. Therefore it is not a coincidence that Ideon as well as Medeon were situated within the Øresund Region which was discussed above and where research and development has the highest priority. The Ericsson representative that was interviewed emphasized the fact that they actually benefit more from being situated in the Øresund Region than from being a part of Ideon. They don’t really use the services offered by Ideon due to the fact that they have long ago grown into a large and independent company. As one of the results of being a part of the region, Ericsson together with Sony Ericsson, which is not an Ideon company, along with some other organizations are involved in the large...
The findings of the Study

research project called ‘Mobile Heights Competence Network’ (Thorvaldsdotter, 2008). Consequently Science Park tenants are not limited only to co-operate with their fellow companies within the Science Park, but have the possibilities to seek new ideas and knowledge from off Science Park firms. These ideas along with the possibilities for future cooperation may have their origins anywhere ranging from a university to a random company located within the region.

Another effect of belonging to an attractive area such as Øresund Region is the fact that highly qualified workforce will be motivated to join tenant companies. Especially, during the times of increased demand for highly skilled people, the attractiveness of the employer’s geographic location as well as its social environment can have deciding effects. If a company decides to become a tenant in a Science Park, one of the results would be the fact that the valuable knowledge of highly skilled people becomes available for the use of this company.

✓ Architecture, Layout and Design

Communicative power of architecture, when used wisely, is thought to facilitate the knowledge transferring activities among Science Park tenants. Certain elements of architecture may contribute to an open-minded atmosphere while others could have the opposite effect. Therefore, Science Parks show their sensitivity towards this fact through certain characteristics which are reflected in the design and layout of their office complexes.

Ideon emphasizes this issue on its website in the following way:

The light, airy architecture inspires thought, and spontaneous, creative meetings have plenty of room to develop. There are also plenty of seminar and conference rooms for planned meetings. Ideon companies also have access to a complete infrastructure, including a fast digital network and professional reception and telephone exchange services. (Ideon Center AB, 2008)

After having visited the premises we can conclude that, the bright, open and communication inviting architecture seems to result in spontaneous interpersonal interactions which were recognized in various parts of Ideon. Even though, one cannot possibly know about the character and the content of the information being exchanged during those meetings, we can reasonably assume that these meetings do significantly increase the possibility of sharing new ideas along with precious knowledge among the Science Park tenants.

Moreover, the actual arrangement of the tenant firm’s offices inside Science Park buildings is worth looking at. The offices are seldom totally private and isolated from other companies, but are often situated in such a way that most of the activities going on within them can be observed from the outside. Through this the open
atmosphere and the receptive mindset are encouraged. The walls and doors are usually made of glass which makes it possible to look through them and therefore observe the activities taking place in the offices nearby. Therefore, if one can physically see that the people next door or across the corridor are working on an interesting project, he or she would be likely to visit them with the aim of exchanging ideas and of mutual learning. Additionally, during the use of shared facilities or a random meeting in the hallway, one would be more likely to interact with someone whose face seems familiar. This can be seen as one of the ways to eliminate the psychological barriers which constrain unfamiliar people with potentially valuable ideas from interaction and possible sharing of knowledge.

Another interesting observation was that it seems that the larger and more independent the company becomes the less willing to communicate with others it is. If a closer look is taken at the offices of Ericsson within Ideon, for instance, one can recognize that this company occupies a whole block in the main building of Ideon. The walls that separate their offices from other tenants are less transparent and the fact that Ericsson has its own reception desk makes them even more isolated from other Science Park tenants. While, on the other hand, Ericsson’s internal policy is to have as much open office space as possible in order to promote an open-minded and receptive corporate culture (Thorvaldsdotter, 2008).

- **Shared facilities**

  Light and airy architecture, inviting atmosphere, plenty of open space, numerous cosy chairs and couches are things which make spontaneous meetings possible, but what actually triggers those meetings are the shared facilities such as restaurants, washrooms, coffee machines or photocopy equipment. These elements can be found in Science Parks more frequently as their premises are shared by many companies and thus, their overall physical structure is expected to correspond to overlapping activities of tenants. Furthermore, people are more likely to interact when their activities overlap, and this is usually intentionally supported by the management of a Science Park through the structural arrangements of the Park.

  The fact that these shared facilities are utilized for personal interactions was confirmed by Jespersson (2008), who admitted that spontaneous meetings with employees of other companies actually happen in the shared kitchen and corridor. Additionally, he stated that if he had more time he would more often take advantage of the opportunities to interact spontaneously with other people, through the use of these as well as other shared facilities.

  Thus, it seems that the presence of shared facilities actually contributes to a higher number of spontaneous interactions which makes the transfer of knowledge more likely.
✓ **Spatial Proximity**

Another important feature of the physical structure of a Science Park is the spatial proximity of tenant companies. As it was said in the theoretical part of this research, face-to-face interactions are considered more preferable than other forms of communication. At the same time spatial proximity facilitates these face-to-face interactions and therefore increases the possibility of transfer of implicit as well as tacit knowledge. Even though Thorvaldsdotter (2008) was sceptical about the usefulness for Ericsson of being an Ideon tenant, they utilize the environment through employing consultants from such Ideon companies as BitSim. Moreover the participation of two Ideon companies, Axis and TAT, in the mentioned above ‘Mobile Heights Competence Network’ was actually triggered by the fact that both companies are situated in close proximity to Ideon.

Additionally, within such a diverse Science Park as Ideon there are possibilities to find future cooperation partners not only involved in the same activities, but also potential customers and people from other areas of expertise who might offer a creative solution for existing issues.

![Figure 6.2 Structural arrangements which support knowledge transfer](image)

To sum up one can say that the structural arrangements within Science Parks are definitely utilized by almost all companies, but to a different extend. Whereas larger companies seem to possess limited awareness of the numerous additional benefits they get from the physical as well as social environment within Science Parks, smaller companies seem not only to be aware of these benefits but also take more advantage of them. It seems to be reasonable that this is due to the fact that the smaller the company the more dependent on the outside world it is.
Furthermore, the Science Park management underlined the influence the whole physical environment has on the success of the companies. They assumed that by putting so many companies together in these favourable surroundings would positively contribute to the amount of co-operation among them. In terms of social structure they are confident in the usefulness of their services which they offer to the companies.

In conclusion the structural arrangements seem to have certainly positive effects on the knowledge transfer within Science Parks. The architecture and the design of the office buildings as well as the shared facilities contribute to an open-minded and knowledge-friendly atmosphere. One has to keep in mind that what the companies receive together with office space is the location in a research intense region, spatial proximity to potential cooperation partners as well as a knowledge transfer provoking social environment which presumably makes being a Science Park tenant extremely attractive.

As far as the explicit knowledge is concerned, it is easily transferable and therefore all the discussed aspects of structural arrangements presumably enhance the transfer of it. On the other hand, the tacit knowledge which can only be shared during observations as well as face-to-face interactions is mainly enhanced through the office layout and the spatial proximity. Thus, one can say that both types of knowledge are favoured by the structural arrangements within Science Parks.

6.3. How the knowledge transfer is supported by Science Park management

As it was said in the previous section the management of a Science Park usually does not possess any formal authority. Therefore, what they can do in order to contribute to favourable conditions for knowledge transfer is to offer certain knowledge transfer enhancing services. Nevertheless, even if services of greatest quality are offered, successful knowledge transfer is still something that has to be accomplished by the companies. Since the success of a Science Park is determined by the degree of the success of its tenants, it seems reasonable for the management of Science Parks to put effort in encouraging the transfer of knowledge.

In the following section we discuss the services offered to tenant firms by the Science Park management which seem to be most effective in influencing the knowledge transfer.

**Networks**

The first kind of services is networks of different interest areas that are promoted and sometimes organized by the management of Science Parks. For example, there are currently five different networks active among Ideon companies. These are the Human Resources, Marketing and Sales, Management, Life Science and IT Communication networks. Participants of these networks meet four to six times a year for discussions with the aim of sharing the ideas concerning the area of interest. These networks are driven by in or off Science Park specialists who mainly serve as
The findings of the Study

experts in the area and as sources of desired knowledge. These specialists may take the initiative of organizing such meetings as well as taking the role of an expert within the area of discussion. Furthermore, only Ideon companies are allowed to participate and thus, making it a unique service for the Science Park tenants. Moreover, companies themselves also have a possibility and are encouraged to organize their own networks concerning issues of most relevance for them. This was actually the case for one of the R&D companies at IDEON which organized its own network and invited others for participation. (Sätherström, 2008) As it was discussed before, it seems that along the process of becoming larger and more independent companies tend to communicate less to other Science Park tenants. This makes them also less likely to join these networks and therefore smaller companies are the ones who usually join. Jespersson (2008), the representative of the small consulting firm BitSim, was aware of the existence of such networks but unable to participate in most of them due to the regular workload.

The representatives of Medeon were proud to present the Life Science Network. This network deals with all issues related to life sciences and its members meet four times a year to share their ideas and knowledge on the announced topic. The network connects established as well as growing Medeon companies with the representatives from the university, life science industry and the University Hospital. Therefore the knowledge transfer between these institutions is facilitated through the organization of these network meetings.

Consequently, participation in the networks offers Science Park tenants great possibilities for knowledge transfer. Thus, it would most likely be unwise for a company to ignore the opportunity for joining a network which could enable it to see how different organizational issues are approached by different companies. Additionally, the network provides the members with a large number of valuable contacts who they can access to share their knowledge with beyond the scope of official networking activities.

✓ **Seminars**

Occasional formal meetings of tenant companies do not only occur between the members of existing networks, but are also taking place in the form of seminars. Seminars seem like a usual practice for any Science Park and are organized and supported by its management. Representatives of different tenant companies gather together and exchange their ideas concerning the topic of discussion. Furthermore, outside speakers as well as independent experts may also be invited to share their knowledge with the participants.

At Ideon seminars are usually held once or twice a month on average. The speakers are either invited from the outside or provided by tenant companies. The main
purpose of the seminars is to share ideas on the topic and establish contacts. In contrast to network meetings large companies often are the ones who initiate seminars as it is a good way for them to be known not only for their core activities. This was the case for the Swedish bank Handelsbanken which held a seminar at Ideon concerning the future trends within technical aspects of banking. Another important feature of seminars at Ideon is that any kind of advertisement is prohibited, so that the speakers would stay within the scope of the topic (Sätherström, 2008). This decreases the possibility of unnecessary promotion and thus contributes to the quality of information shared during the seminars, making the knowledge transfer more likely.

Even though these seminars have a great potential value, not all of the potential companies are willing to attend these seminars. The main reason behind this is that people may personally decide that it is unnecessary for their company or they simply do not have enough time as it was in the case of BitSim.

Seminars and their effects on knowledge transfer are quite similar to those of network meetings. However, people are not obliged to become members of the network, where meetings are carefully planned ahead, in order to participate in the discussion. Seminars are spontaneously planned and are often attended by people with different backgrounds and knowledge. This fact is likely to contribute to a larger number of participants as people get motivated if they know that different interesting views on the topics might be presented.

**Informal meetings**

While the participation in different networks and seminars serves as a formal reason for companies and their representatives to meet, numerous informal interactions are also encouraged by the managements of Science Parks.

In the case of Ideon its relationship with the Lund University of Technology takes place most of the time in an informal way. Once a month lunch-meetings are organized by Ideon at the university where either representatives of Ideon companies or members of the Science Park management give speeches and communicate with professors as well as students. Informal events such as parties for Science Park tenants are also a regular practice at Ideon. Comparably, Medeon management organizes breakfast-meetings each Friday where different representatives of Malmö University are invited to participate.

The possibility of such informal meetings is assumed to offer great opportunities to share ideas and knowledge. When people are not bound by formal obligations they presumably become more willing to communicate freely and therefore exchange valuable ideas among each other.
Moreover, informal communication appears to be attributed with high importance for Science Parks as well as their tenants since all participants in the study seemed to be aware of this issue. They all emphasized their motivation to support and provoke these informal knowledge sharing activities and as one of the Ideon brochures claims that “the queues outside our restaurants and canteens rank among the most creative environments in the country” (Ideon Center AB, 2008). This is due to the great amounts of communication in this informal environment.

**Differentiated approach to tenant companies**

Another important feature of Science Parks is that different companies are treated differently in terms of needed attention and support. If it is a small start-up company it can join the incubator and get the most attention and support. If it is a middle sized company with established activities it joins the Science Park itself and is offered different possibilities for cooperation with the other companies. And if it is a large and independent company a Science Park is ready to offer large enclosed office spaces.

The concept of an incubator deserves special attention in terms of how the knowledge transfer is facilitated through managerial activities. When a small start-up company, for instance, is willing to join Ideon it can become a part of the incubator which is called Ideon Innovation. Within this incubator a business coach is assigned to support and consult the company during the early stages of its development. He provides this small company with all the necessary information needed to grow and develop into a more independent and successful organization (Sätherström, 2008). Similarly, the incubator at Medeon offers life science start-ups training in the areas of patent rights, financing, banking and legal matters. This is done through regularly organized workshops for the participants of the incubator. The incubator companies are also simultaneously involved in numerous research projects which makes them interact more often and therefore come up with and share valuable ideas together.

The differentiated approach tries to satisfy the demand of different company categories for attention and support in the best way. This is assumed to result in the fact that the amount of effort put into the knowledge transfer enhancing services is distributed more efficiently among the tenant firms. If all the tenant companies would be assisted in the same way, it seems reasonable that large amounts of effort would be wasted.

**Information management**

As discussed in the theoretical part of this study knowledge derives from information. Therefore the appropriate management of information may also stimulate the knowledge transferring activities within a Science Park. This is
accomplished by the Science Park management in different ways. Ideon, for example, is trying to promote the success stories of its tenants by mentioning them on their informative website, in the Ideon newspaper, and in the weekly e-mail newsletter. Furthermore, Ideon has a newly developed website which also includes such feature as extranet allowing outside companies to communicate more freely with Science Park tenants (Sätherström, 2008). In Medeon along with the regular website they have an intranet where the information concerning Science Park services together with contact details of each member of the Science Park can be found. Furthermore, they are working on a new PR strategy with the aim to make the information concerning Medeon companies and their activities more accessible. One of the consequences of this strategy is that they plan to launch a Medeon Newspaper additional to numerous brochures in different languages which are already available.

Information technologies are a necessary attribute of the process of knowledge transfer and therefore presumably should not be ignored by the participants of this process. In fact, the interviewed representative of BitSim, despite the fact of being most of the time busy with the usual workload, admitted that they do receive the weekly newsletter and are actually aware of the events that take place at Ideon. Through these information services people within Science Parks gain easier access to information concerning the activities taking place in other tenant companies. Consequently, they may become aware of who works on relevant topics or was involved in similar experiences and therefore may possess valuable knowledge which might be worth sharing.

Thus, it can be concluded that the transfer of knowledge seems to be actively supported through these information management activities.

![How the knowledge transfer is supported by the Science Park management](image)

**Figure 6.3 Science Park Management supporting activities**

In conclusion one can say that the services offered by the management of the Science Parks (see Figure 6.3) seem to have positive effects on the knowledge transfer activities within them. Referring to the discussed theories on knowledge management, one can recognize personalization as well as codification strategies applied in Science Parks. Networks and
Seminars which emphasize the personal relation between people and support the direct exchange of knowledge can certainly be classified as personalized strategy; whereas codification strategy seems to be used when information is spread through official publications and material.

The services offered are perceived by the tenant companies as useful prerequisites for the sharing of valuable ideas which allow them to conduct better business. Jespersson (2008) brings it to the point when he says: The “critical issue is to bring people together. And this is what they [the Science Park management] are trying to help with. And if they succeed, then knowledge transfer becomes better.” This is assumed to be relevant for most of the Science Parks.

Driven by the goal to contribute to the success of tenant companies, the Science Park management offers the mentioned above services with the strong belief that their goal will be achieved through this. Therefore, considerable amount of effort is devoted to further development of the quality and variety of these services.

As discussed in section 6.2 the favourable conditions for the transfer of explicit knowledge are not that difficult to establish compared to conditions for tacit knowledge transfer. Therefore information management and informal meetings serve as facilitators of knowledge transfer which is mainly explicit. Whereas networks, seminars and especially the differentiated approach to tenant companies lay a fair ground for the transfer of explicit as well as tacit knowledge. Hence they are perceived as highly valuable services offered by the Science Park management.

In general, a Science Park management serves as a mediator connecting the companies seeking assistance in certain aspects with the companies or individuals who possess the necessary knowledge. Therefore, through connecting the sources of knowledge with the recipients a highly valuable contribution to the knowledge transfer is made.

**6.4. Common Barriers to knowledge transfer**

The before presented characteristics of Science Parks, apparently make these organizations attractive and favourable locations for knowledge transfer. Nevertheless, knowledge transfer most the time happens spontaneously and seldom on real purpose. Additionally, different barriers exist which actively prevent the knowledge transfer from taking place. These barriers are not only present in Science Parks but also in off Science Park firms. However, they are relevant for the study to understand what hinders people from sharing and transferring their knowledge more frequently. Furthermore it is only possible to actively disintegrate these barriers if people are aware of them and can identify them in their organizations.

During the research the following barriers to knowledge transfer were recognized as most common:
People do not recognize the value of knowledge

The first barrier which was identified is the common absence of valuation of knowledge which is not in the exact field of expertise of the employee. As it was stated above, it is difficult to measure the results of knowledge transfer which often results in the underestimated value of potential knowledge. It appears frequently that people disregard the knowledge of other subjects as they don’t feel that this could be valuable for them as well. Computer specialists in Ideon, for instance, showed aversion against sales seminars as they didn’t see any benefit from the knowledge offered. To their surprise during the seminar they very well recognised the worth of this knowledge, to understand and be able to produce products suitable to customers’ needs, whereas they would have hardly been able to acquire this kind of knowledge within the area of their expertise.

There is always a possibility, especially for experienced workers within a certain domain of knowledge, to discover themselves in the trap of thinking that they already know enough and that nobody can tell them anything new. Hence, they don’t value new ideas of colleagues enough and therefore may lose great opportunities. Another important issue is the one of know-it-all mentality usually practiced among young entrepreneurs, who do not possess much experience, but assume to already know everything needed to start a business. They may reject the knowledge people want to reveal to them and don’t listen to highly valuable advices properly.

In both cases, this limited scope of interest decreases the absorptive capacity of employees and it seems most reasonable that this results in decreased innovativeness, creativity and consequently competitiveness. A possible solution to this issue would be to demonstrate the value and the application possibilities of the knowledge from other areas. Then it is likely that the people may become interested in gaining and transferring more knowledge in order to utilize the positive effects of it.

Lack of experience in sharing knowledge

As a consequence of the low value that employees often attribute knowledge with, they do not recognize the chances for the transfer and absorption of knowledge in convenient situations. Even though they might talk with somebody who could offer them highly valuable information, which is likely to happen within Science Parks, people do not try hard enough to provoke the person to reveal this knowledge to be able to benefit of it. This does not mean that they should intentionally pump their partner for useful information; rather they are hardly aware of the knowledge transfer opportunity and do not have experience in positive effects of knowledge transfer.

On the contrary, people often fail to reveal knowledge to other people even though they know it would be valuable for them. Often a lack of experience in sharing
knowledge is the reason for this as they either cannot articulate their knowledge in the right way for the recipient, or they don’t see the benefits of revealing something to others. People seem to expect too much in reward when giving something. They want to give only if they see what comes back from it. But according to Sätherström (2008) this attitude is wrong. “You should start with giving and when you have given enough, people will give you!”

This lack of experience seems to be only possible to overcome through showing best practice examples and, as simple as it may sound, through practical experience. When employees see the benefits of sharing and transferring knowledge and know how to accomplish this process successfully they may start doing it on their own.

Lack of resources

Another issue influencing the knowledge transfer between people is the lack of resources within organizations. Especially the shortage of time is viewed by us as a relevant issue. It seems that people are most of the time too involved in routine activities connected to their everyday business, while they could be considering and utilizing the knowledge transfer opportunities. It seems that companies really appreciate the services and offers of Science Parks, but a common answer by the companies is that “they want to participate but they don’t have the time” (Jespersson, 2008).

This lack of time is often caused by scarcity of personnel which more often than not leads to the absence of somebody in charge for handling knowledge transfer related issues. Seldom companies employ people responsible for knowledge management with the explicit objective to train and grow the awareness of knowledge transfer and the issues connected to it in their employees. This may not be a common practice within Science Parks since most of their tenants are small or middle sized companies, which makes the issues mentioned above even more critical. They often cannot afford hiring a person responsible for knowledge transfer, and thus the potential of reaching success through effective knowledge transfer is lost.

Fear of revealing corporate secrets

The last mentioned barrier to knowledge transfer recognized in the study is the fear of people to reveal too much of their corporate knowledge which could result in decreased competitiveness. They tend to keep their ideas and developments in secret as they are afraid of losing their business’ potential to competitors. This happens quite often and is, according to Sätherström (2008) a relevant barrier to knowledge transfer. “Still the mindset is that ‘I can’t tell a thing’. And so they are not doing that, even though there are actually quite a few things they can’t tell.” Moreover, as it was mentioned in the theoretical part of this research, certain authors see the fear of losing intellectual property rights as one of the most important obstacles. Also Warg
(2008) admits that companies keep their intellectual assets, the knowledge base, as one of the most valuable capitals, often too heavily protected in fear of losing competitiveness. Quite often companies have not been in situations like this that they own valuable knowledge and therefore, in an act of panic, think that they cannot talk to anybody anymore.

However, this fear is not prevailing for all Science Park tenants and cannot be applied to companies in general. Jespersson, the representative of the consulting firm BitSim argues that they do not have anything to hide. “We try to transfer as much knowledge as possible. We are so specialized that we don’t feel any risk that we give too much and they wouldn’t continue the co-operation.” Also Ericsson seems to perceive this issue to be not as relevant for them. They see more advantage in the close co-operation and therefore the knowledge and technology transfer with partner firms than in being afraid of revealing too much.

![Common Barriers to Knowledge Transfer](image)

**Figure 6.4 Barriers to knowledge transfer**

Concluding one can say that the above summarized barriers to knowledge transfer present in Science Parks (see Figure 6.4), seem to be relevant also to off Science Park firms. These issues are mainly characterised by the general business environment and the attitude of the people working in companies. Most of the mentioned barriers would probably be possible to decrease through the investment of time and money in introducing the most relevant prerequisites of successful knowledge transfer to people. However, as time and money are limited resources, it seems unlikely that companies will soon change their attitudes towards knowledge transfer significantly.

The aspect of inexperience, however, could be solved for each company just as the time goes by. When people gain experience they also may recognize the value of knowledge transfer and how they can benefit from collaborations.
7. Conclusions

In order to complete this study on knowledge transfer in Science Parks, this chapter consists of the conclusions the authors draw based on the presented research. This is done, firstly, by summing up the main messages ascertained during the research and secondly, through suggesting some knowledge transfer enhancing conditions which seem to be feasible also for off Science Park firms. Finally, certain future issues for research which would presumably add more relevance to this study and contribute to the general topic of knowledge transfer are suggested by the authors.

7.1. Final Inferences

In general one can say that Science Parks seem to offer a good and favourable environment for knowledge transfer. The transfer of explicit as well tacit knowledge actually takes place. Even though the transfer of tacit knowledge requires higher effort, it seems to be successfully facilitated by the conditions created within Science Parks. Companies as well as research institutes have multiple possibilities to co-operate and collaborate with various partners in order to utilize their knowledge on certain topics. As these partnerships can be recognized also in reality, the knowledge transfer seems to be exercised between them as well.

Nevertheless, these partnerships are far from exploiting all promising options and therefore much room for improvement is available. In order to achieve these enhancements in the field of knowledge transfer and the expected business success, mainly the management of companies are expected to become proactive. This is because it seems that the main barrier to knowledge transfer can be found in the attitude spread within the culture of organizations which may restrict, or at least not promote, the exchange and transfer of ideas and knowledge. Thus, it seems reasonable that the management of organizations has to be aware of the potential knowledge transfer offers to their organizations and consequently try to establish a culture supporting co-operations and knowledge transferring activities. Moreover, it seems that within organizations not enough attention is paid to the management of knowledge, and therefore the knowledge transfer as a sub-category of knowledge management attracts even less interest.

Another conclusion which can be drawn from the research is that the universities often seem to be not as much included in the co-operations and knowledge transferring activities within Science Parks as one would expect; especially considering the large knowledge base available at these institutes. Even though most participants in the study recognized this factor, it seems that the companies as well as the universities are not really concerned about this and only try differently to establish stronger relations with each other. From the knowledge transfer perspective it seems to be unwise to hesitate too much as a lot of potential gets lost when ignoring the valuable knowledge constantly generated and contained within other organizations.
Knowledge transfer is facilitated and accomplished with greater success within the special environment of incubators which are often sub-organizations in Science Parks. In these incubators many of the identified knowledge transfer enhancing conditions can be recognized and contribute to a lively atmosphere of knowledge sharing. This is most likely based on the attitude of the people and the intensity of the environment, as the people, often inexperienced entrepreneurs, are more receptive towards advice and support from others with the aim to put their business ideas on solid ground and develop into a successful enterprise. These people often share the same problems and challenges in the early stages of their businesses and therefore are more likely to help each other than mature companies which have to deal with their own, often specific, challenges and issues.

Additionally the characteristics of incubators certainly promote the knowledge transfer actively. The limited number of companies and people within one incubator leads to more social interactions and therefore to more communication in its different forms which is one of the most important prerequisites for knowledge transfer. The architecture of the buildings that the incubators usually occupy often provokes mutual contact between people from different offices which again contributes to communication and knowledge sharing as well as transferring activities.

Thus, it seems that incubators which serve as ‘care-takers’ for start-up companies offer an excellent environment where knowledge transfer actually happens.

If this concept proves to be successful, it would be logical to apply it not only to start-up companies but also to other groups of companies such as small and medium sized companies. However, this seems to be problematic to apply when it comes to larger and more mature companies who need knowledge more in specific areas and not so much about the basics of running a business. Thus, to provoke knowledge transfer for these businesses other ways have to be found. And this is exactly what Science Parks try to do by bringing similar companies together.

Summing up the research, one can say that Science Parks provide companies with a favourable environment to exercise and develop their businesses especially through the various opportunities to gain new knowledge through collaborations and other knowledge sharing activities. As the main points enhancing knowledge transfer in Science Parks the study emphasizes the following features:

- Social and physical structure which are provoking knowledge transfer
- Spatial Proximity as a communication enhancing factor
- Support through the Science Park management
- Awareness and possible avoidance of barriers to knowledge transfer
7.2. Transferability of the findings

After having carried out the research on knowledge transfer in Science Parks, it seems to be possible that some of the recognized knowledge transfer enhancing conditions within Science Parks can be applied to companies outside of Science Parks.

Any company can benefit from the appropriate use of relevant knowledge which presumably enables it to become more competitive and use its resources more wisely. Therefore it is essential not only to absorb and spread the knowledge inside the company, but try to avoid the loss of knowledge which may happen when experienced and highly valuable employees leave the company.

A necessary prerequisite for any company before dealing with issues concerning the transfer of knowledge is to become aware of the value of knowledge and its potential influence on the success of the company. Deriving from this awareness the company may realize the necessity of containing the knowledge in it and avoiding its spillovers. Hence, the knowledge has to be managed which implies the emphasis on the transfer of knowledge. As this study showed, the knowledge transfer is actively supported through environmental characteristics of Science Parks and thus, raising the issue of the applicability of the same characteristics outside of Science Parks.

Even though, off Science Park companies operate within a different environment numerous of their properties correspond to those of Science Parks tenants. This, in turn, allows them to be looked upon in terms of the effectiveness of knowledge transfer and offers a possibility for its enhancement.

The information gathered during the present study gives the ground to assume that the following knowledge transfer enhancing activities could be extrapolated from the Science Park tenants to the off Science Park firms:

- Participation in the exchange of ideas concerning knowledge transfer and its process with the aim to become more aware of the knowledge transfer issues and to know how to deal with them. This can be achieved through the partaking in formal as well as informal meetings with the representatives of other companies or institutions who have certain experience of dealing with knowledge transfer. Furthermore, these meetings could make them realize the importance of information which is outside of their area of expertise and is potentially accessed through different interactions.

- Evaluation of their companies’ structural arrangements and their influence on knowledge transfer. Such aspects as social structure, geographic location, layout of the building and offices, architecture and design are necessary attributes of any organization which, as it was discussed in the study, either stimulate or hinder the transfer of knowledge.

- Awareness of the existing barriers to knowledge transfer such as failure to recognize the value of knowledge, lack of experience in sharing knowledge, lack of resources or
fear of revealing corporate secrets. These barriers seem to be relevant for most of the companies and the awareness of them offers a possibility for their avoidance and therefore for the potential increase of the knowledge transfer efficiency.

- Facilitation of knowledge transfer activities by the companies’ management. It is difficult to generalise on this topic since the management of Science Parks does not possess any formal authority over the tenant companies and therefore its actions are limited to some extent. The management of regular companies, on the other hand, generally possesses certain amount of formal authority. Therefore, how the concept of knowledge transfer is perceived and approached within a regular company depends to a large extent on how it is viewed and supported by its management.

Since the ground for the generalization of the findings of the study seems to be found, one may conclude that the issues brought up within the scope of this study seem to be interesting and useful not only for the individuals somehow involved in Science Parks, but also for the employees as well as the management of regular companies.

7.3. Future research issues on this topic
With having examined the final results of this study, one can think about interesting issues which could be covered in future studies.

Even though the study tried to draw general conclusions on the knowledge transfer in Science Parks, still it was mainly based on the case study of Ideon. To give more credibility to the research the second Science Park, Medeon, was included in the study, but its characteristics are quite similar to Ideon and no significant differences were found. This on the one hand could prove the value of the presented results but also be based on the similarity of both Science Parks. Therefore it would be interesting to examine if the results can be seen as valid also when a larger number of more diversified Science Parks would be investigated. Especially when the Science Parks have different characteristics, for example in terms of location, size, specialization, etc., interesting differences may be possible to recognize. To scrutinize on the conclusions of this study by doing another empirical study would also follow the Grounded Theory approach of Strauss and Corbin (1990) where the quality of the research is increased by doing multiple check-ups between theoretical and empirical level.

Another interesting issue for future research would be the examination of the influence of the higher education institutes on knowledge transfer in Science Parks. Therefore it would be possible to compare the knowledge transferring activities in Science Parks with Parks where only companies are clustered in spatial proximity without any connection to a research institute; often called Business Parks. According to Sätherström (2008) 70% of the companies in Ideon have their roots in the attached university and therefore it can be assumed that the Science Park companies are mostly in a relatively early phase of their development. Thus, in these parks the maturity of the tenants is probably significantly higher than in Science Parks and therefore it seems reasonable that the knowledge transfer
would be accomplished with a higher degree of resistance than in Science Parks. It would be interesting to find out if this assumption would be still relevant within the empirical world.

Squicciarini (2007) examined a study comparing the performance of Science Park tenants with off Science Park firms in terms of innovativeness. Following this approach it would be interesting to compare Ideon tenants with off Science Park firms in the same region, the Øresund Region. This would give the possibility to investigate whether the assumable increased knowledge transfer within Ideon influences the innovativeness of the tenants compared to their outside Science Park opponents. Especially when the companies would be chosen with comparable characteristics to the ones studied in Ideon, it seems reasonable that highly meaningful results could be seen.
**Final Statement**

Obviously, this study only threw a light upon a small area of the highly interesting field of knowledge transfer. Therefore, it should be seen as a contribution to the research in this area and does not claim to have established a universal truth. Times and circumstances are changing and new studies might arrive at different conclusions. However, this would not derogate the quality of our research but rather enrich the research within this topic.
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Visiting address: Kalmar Nyckel,
Gröndalsvägen 19
SE-391 82 Kalmar, Sweden
Tel: +46 (0)480 - 49 71 00
www.bbs.hik.se