Internationalizing Technopark

Master Thesis
Innovative Entrepreneurship & Business Development

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Preface

Now that my final master thesis is completed, I can safely state that I did not take the easy way. Translations requested all of my patience and the volume of work to be done was occasionally frustrating. I did take an interesting way, however. I was given the opportunity to enlarge my knowledge of Russian business culture in a unique environment that would otherwise have remained closed to me. All my efforts resulted in this report, that researches MEPhI spin-offs located at Technopark and their possibilities to internationalize with help of a Dutch partner, and what role the MEPhI entrepreneurial support structure can play in this respect. Not only is this interesting for MEPhI and the companies in question, but also for anyone who is interested in Russian business culture.

This research was carried out in the framework of the CROSS project. The Dutch Ministry of Economic Affairs developed this CROSS project for knowledge transfer between the Netherlands and Central and Eastern European countries. The memorandum of understanding for collaboration in education with the Russian Federation forms the official framework of the CROSS activities in Russia. Within this framework, there is a collaboration between the University of Twente and MEPhI on educational processes and on entrepreneurship in networks. The last project is aimed at commercializing knowledge and is the framework in which my research is embedded.

I would like to thank several people. First of all, Bernard Nieuwendijk for pointing out this possibility to me, Irina Souch for introducing me at MEPhI and providing background support, A.N. Petrovskyi for his hospitality to accept me at Technopark and provide me with necessary information, Igor Prokhorov for his concern about my wellbeing, Patrick Bliek, Jann van Benthem, Jaap van Tilburg and Kees Eijkel for their consultations, all other colleagues of NIKOS and Technopark, and all directors and staff of Technopark that were interviewed. I would also like to thank the students who helped me with the interviews, who created an extra dimension to the research. I would like to thank Grigoryi Debedev especially, for his help whenever this was needed. But most of all I would like to thank Aard Groen and Jeroen Kraaijenbrink for guiding me through the process, their patience to read all lengthy documents sent to them, and their company on a first visit to MEPhI.

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'There is more light than can be seen through the window'

Russian saying

Chapter 1: Introduction to the project

1.1 MEPhI and Technopark

The Moscow Engineering-Physics Institute (MEPhI) is a renowned Russian state university that was founded in 1942 as a mechanical institute for ammunition. It educates physics, mathematicians, system technologists and research engineers and can count Nobel Prize winners among its graduates. MEPhI professors and alumni contribute greatly in theoretical and experimental physics, mathematics, cybernetics, and computer sciences. The mission is to 'advance learning through the integration of teaching, research and service to others' (www.mephi.ru).

To preserve the scientific potential of MEPhI and to encourage entrepreneurship initiatives in the high-technology sector, including commercialization abroad, MEPhI established a scientific technology park in 1993. The main goals can be read in appendix 1A. Technopark v Moskvorechje is a non-commercial organization where a total of approximately 40 spin offs have executed their activities. Currently, there are 25 companies with 350 employees. These firms are active in 12 different areas, such as water purification, ecology safety, simulators for APPs and new materials. The total set of fields is summed up in appendix 1B. In 2005, sales was more than 375 million rubles, which is more than 10 million euro.

Technopark collaborates with more than 20 other Technoparks in Russia and has contacts with scientific parks and business-innovation centers in the UK, Germany, the Netherlands, South Korea, and Finland. It is a member of the Chamber of Commerce and Industry and takes part in the International Association of Scientific Technology Parks and Business Incubators.

1.2 Introduction to the problem

One of the goals of Technopark is to develop international scientific and technological relations and to transfer native technologies to foreign markets. There is no reason to believe that the quality of knowledge and products are not sufficient to compete with those of highly developed countries. At Technopark, European companies could try to find new technologies that are not familiar to them, or they can buy known technologies cheaper. Yet, the world is not familiar with many of the products or knowledge developed at MEPhI spin-offs, although former principal of MEPhI, B.N. Onykyi, stated that the better performing companies are also known across Russia's borders and that much progress has been made since 1993 (10 let na rynke vysokikh tekhnologyi, 2003). For instance, Quarta-Rad produces devices for ecological monitoring that are sold world-wide through resellers, Eskiz-MEPhI has tried to become partners with a Dutch firm, and Lidasa has worked on projects in Arabia. However, almost all current international activities are coincidental and derived from initiatives of the other party.

What it comes down to is that despite the previously mentioned goal to internationalize, the extent to which international contacts are integrated in the networks of the companies operating at Technopark is not satisfying. This problem was recognized by the director of Technopark, A.N. Petrovskyi, and by several of the Technopark staff. They indicated that the potential of the firms is not maximally exploited because foreign markets remain uncovered, leading to missed opportunities in growth and development. In this way, more international commercialization would benefit the firms. Technopark itself could also benefit from more international contacts. Foreign activities would add to the experiences of the park, which it could use in supporting the next generation of spin-offs.

The problem can be formulated as follows:

'Despite possibilities for international competitive advantages through cheaper or new technologies, there is an unsatisfactory level of international commercialization of knowledge developed at Technopark firms.'

1.3 Environmental context

To understand the problem fully, and to gain more understanding for the rest of the report, the environmental context of this research should be taken into consideration. This includes knowledge intensive high-tech entrepreneurship in networks and the Russian context.

1.3.1 Knowledge intensive high-technology entrepreneurship in networks

Knowledge Intensive Entrepreneurship refers to 'entrepreneurial activity in industries where rapid advances in knowledge are a key to understanding new venture creation, competitive advantage, and ultimately market success'. Typically, they are network based firms performing their knowledge creation within networks of firms and individuals and collaborate across organizational boundaries (Brännback et al., year unknown). Groen et al. (2002) state that there is a growing multi-disciplinarity of technological innovations to be witnessed on one side, whereas there is also a need to specialize because of fast growing technological developments. For this reason, many R&D activities are carried out within a network of firms of different sizes, universities and other knowledge institutes. For the manager or director of a company it is important to have insights into what actor of a network brings in what contribution (Groen et al., 2002). Englis (2007) also recognizes that knowledge based enterprises have a shortened 'window of opportunity' and are likely to be 'small, fast growing, organic, and network-based firms with high burn rate'. The network is used to internationalize rapidly (Englis, 2007). Knowing this, the network aspect can be used to internationalize the Technopark firms.

1.3.2 Soviet heritage

When the USSR collapsed, the process of entreprisation came into being, which is the process of 'creation, transformation or adaptation of a former socialist organization in combining and exploiting its assets in a new way in order to sell goods or services and be able to continue its activities' (Couderc, 1996, p. 15). Bruton and Rubanik state that the 'former Soviet Union boasted of many world-class technologies', but that research institutes installed by the Soviet authorities were of purely scientific nature, whereas there were market-inclined models in the West (Yashiro, 2004, 727). After the collapse, the more developed market economies already established conditions for a more or less efficient interaction between science and industry, whereas in Russia the market itself was a new phenomenon (Glebovskaya, 2004). Connected with this is the fact that in developed countries there are ten managers per one scientists, whereas in Russia there is one manager per ten scientists who is equipped enough in the field of international scientific and technological cooperation. As heritage from the USSR, graduates normally receive narrow-specialized technical knowledge, increasing the demand for technically trained graduates with foreign language skills to improve the quality of modern management decision-making in the area of high technologies promotion (Institute for International relations, 2002).

1.3.3 Research funding

The collapse of the planned economy caused a rupture in research funding, which used to come from the state. Now, various financial sources had to be sought, leading to difficulties in paying appropriate wages because of which many employees of research institutions were pushed to look for opportunities in the commercial and industrial sphere. To prevent a massive brain-drain, researchers were freer to allocate their working time than other categories of workers, were paid in priority and received tangible advantages. The institutes preserved skilled staff with minimal financial effort and scientists were able to work on research to produce applications which would hopefully

yield a profit. Also, they could use equipment, facilities and know-how of colleagues from the institutes (Couderc and Franceschi, 1999). However, research activities are considered an investment that should be financed by profitable activities, and academy institutes cannot be privatized while state financing has become very low (Couderc, 1996).

1.3.4 Intellectual Property

Another relatively new phenomenon in Russia is intellectual property. In the USSR, no such thing as property existed and in the transition economy it was not efficient to patent inventions as patent fees increased tremendously in a short time and inflation decreased the real value of sold licenses. Although the situation has stabilized, patents are still expensive. For this reason, much know-how is protected through secrecy or social relations. (Glebovskaya, 2004, p. 2-3)

1.3.5 Social relations

As said previously, know-how is often protected through secrecy and social relations. This is why Glebovskaya argues that social networks and cultural patterns are essential (Glebovskaya, 2004). The same counts for the uncertainty that results from historical conditions. Jager (2003) found that there is a low level of interdependence between large firms, subcontractors, banks and other financial institutions in Russia because of lack of trust and a reliable legal system. Because of this, alliances are replaced by ownership structures and a great degree of internalization or barter is used to arrange transactions and to minimize contracting breach. It could be said that risk sharing is not done through partnerships, but through diversifying the business portfolio. Although the previous is in the context of large firms, it provides insights into the collaboration culture in Russia. Jager links this lack of 'strong institutional trust mechanisms' with an 'extensive reliance on personal networks between enterprises'. In addition, there was always a predominant focus on short-term growth because there was an 'inability to rely on formal rules' (Jager, 2003, p. 17). According to empirical evidence from Stark (1996) in Batjargal (2002) 'firms in transition economies enter and build deliberately a complicated web of interconnected firms where assets and liabilities are creatively dispersed in order to reduce the harming effects of environmental uncertainties'. Batjargal concludes that 'the heterogeneity in relational and resource dimensions of initial social capital of entrepreneurs determines varieties of entrepreneurial performance in Russia', implying that 'entrepreneurs should recruit more resource-rich weak ties into their personal networks' (Batjargal, 2000, p. 3).

1.3.6 Background implications

Based on the previous information, it is likely that various aspects are different in Russia than in Europe. This could be of influence to the understanding of the rest of the report. An example is the interaction between science and industry in Russia, that is likely to be improvable. In Russia, there are more scientists than managers, and it is likely that scientists are more interested in developing new technologies than actually solving extisting customer needs. The question arises whether or not the firms at Technopark are also more push-oriented than pull-oriented. Another example that could influence the understanding of the rest of the report is state funding. State funding decreased tremendously after the collapse, and new technologies are expected to finance themselves. When little financial support is provided, also in initial stages of development, money would be spent on the most basic things, leaving less room to spend it on international expansion. One could expect that the spin-offs receive little or no financial aid from MEPhI or Technopark, as MEPhI is a state university. A third example of differences between Europe and Russia is that the firms of Technopark are expected to have few patents because of the expenses. From this, it follows logically that international patents would be even rarer. This has consequences for the protection of knowledge in domestic and foreign markets, limiting competitive advantage and the power base of the companies. Next to this, the secrecy connected with lack of patents would impose severe difficulties in transferring knowledge to other countries. A final example is that the firms of Technopark are predicted to highly value their social relations, although they would be mainly focused on short-term growth. The contacts would be mainly used to overcome uncertainties in formal rules in Russia. Firms

at Technopark could be expecting other roles from their international contacts than the international contacts themselves might expect.

As could be seen, the Russian culture and heritage is very different from those in European countries. From this, it could be doubted whether or not the general pattern for international inter-firm collaboration could be followed in this Russian context. Hagedoorn (1998) concluded that 'strategic technology partnering with firms from Russia appears to follow the general pattern that is also found for alliances within the developed economies' and that 'the current academic perception of international alliances, in particular alliances between companies from the industrialized countries, is also relevant for understanding international strategic technology alliances with Russian firms' (Hagedoorn, 1998, p. 184).

1.4 Project objective

There is an unsatisfactory level of international commercialization of knowledge developed at Technopark firms, where more international commercialization is expected to lead to growth and development. To internationalize, foreign contacts are necessary. Although the individual firms would benefit mostly from more international contacts, it would be wise to provide recommendations that Technopark can use in order to also benefit the next generation of spin offs.

It could be said that the objective of this research is to provide recommendations for high-technology firms at Technopark to enhance their level of internationalization in networks with the aim of business development.

1.5 Research issue

When providing recommendations to enhance international commercialization of technologies developed at Technopark firms, three players are of importance. First of all, the characteristics of the firms

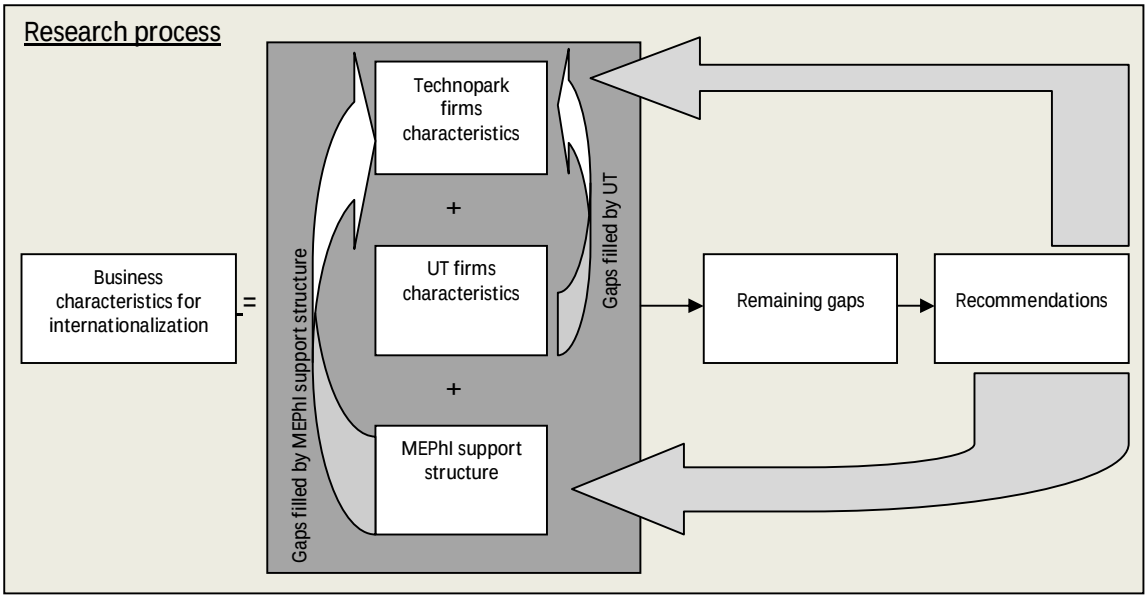

Figure 1.1: Research process

themselves will be explored to know what aspects for internationalization are present or lacking. Secondly, potential partnerships with firms from the UT will be researched in order to investigate possibilities for success and in what areas these firms can enhance the characteristics for

internationalization of Technopark firms. These UT firms serve as illustrations, it is not the objective of this research to establish actual partnerships. Last, the MEPhI entrepreneurial support structure will be included to see in what way it adds value to the internationalization process of the firms. Only then is it possible to see which aspects for internationalization are present and which are lacking.

Recommendations need to be made to fill remaining gaps. Figure 1.1 depicts the previously mentioned situation.

1.5.1 Research questions

Based on all of the above the following research question can be asked:

'What characteristics of Technopark firms should be improved for international collaboration and what role can the entrepreneurial support system play in this respect?'

To be able to answer this, several other questions need to be asked:

1. What business characteristics enhance international collaboration between high-technology spin-off companies according to theory?
2. How can an entrepreneurial support system add to these business characteristics for international collaboration between high-technology spin-off companies according to theory?
3. To what extent do Technopark firms possess the necessary characteristics for international collaboration?
4. To what extent can characteristics of UT firms add to the characteristics of Technopark companies for international collaboration?
5. To what extent does the entrepreneurial support structure of MEPhI add to the business characteristics of Technopark firms for international collaboration?
6. What recommendations could be given to enhance collaboration between Technopark companies and UT firms with the aim of business development?

Before the problem of an insufficient level of internationalization of Technopark firms can be solved, several steps need to be taken. First of all, it needs to be clear what aspects would enhance internationalization. Therefore, a theory needs to be found on what these characteristics are that firms need to possess. Sub question 1 was included for this purpose. In order to judge the potential for international collaboration of the firms at Technopark, there should be an assessment to what extent the aspects that should enhance internationalization are present. This question is asked in sub question 3. This is not enough, however, as figure 1.1 showed that there are three actors in the process. To illustrate possibilities for international collaboration with the current business characteristics and to see how potential partners could fill any gaps of the Technopark firms, these potential partners need to be found and investigated as well. The easiest way to do this is to find firms connected to the UT, for access reasons. Sub question 4 is asked to find answers to these aspects. Next to this, it was pointed out that the MEPhI entrepreneurial support structure also plays a role in enhancing international collaboration of the firms, which is why there needs to be a theory on how a support structure could ideally help the companies. For this reason, sub question 2 is included. The real added value of the MEPhI entrepreneurial support structure to Technopark firms can be found with help of the theory, as it needs to be researched to what extent the ideal support instruments are present. Sub question 5 assists in finding this answer. Only after it is known which characteristics are present at Technopark firms and which are lacking, after which an inventory has been made which lacking characteristics can be filled by the partner or by the support structure, suggestions can be made on what tools to develop further in order to enhance international collaboration. Sub question 6 is the corresponding question. After all sub questions are answered, there should be enough information to propose how the given problem could be solved.

1.5.2 Main concepts

The main concepts used are business characteristics, international collaboration and entrepreneurial support system. Business characteristics are capabilities and resources possessed by a company. International collaboration is seen as a partnership between two firms from different countries with the aim of commercializing knowledge. Last, an entrepreneurial support system includes all programs and instruments that the mother university offers its spin-offs to facilitate growth and development.

1.5.3 Route to answering the research question

The first two questions are of theoretical nature, to which the practical data will be tested. These answers will be found through literature search. Questions 3 and 4 analyze the current characteristics of Technopark firms and to what extent the potential partner from UT could add to these. The results from these question will be compared with the outcome of question 1. Question 5 analyzes the current situation of the MEPhI entrepreneurial support structure. The ideal situation is not only dependent on the outcome from literature search in question 2, but also on specific needs that became apparent from questions 3 and 4. For this reason, the results from the fifth question will be tested against the outcomes of questions 2, 3 and 4. The third, fourth and fifth sub questions will be answered through interviews with directors of firms and experts on support instruments mostly, although desk research is also used. The last question will fill the gaps between what should be and what is and should flow logically from the results of all other questions.

1.6 Division of the report

The rest of this report is divided into six parts. The next chapter will provide a theoretical background on necessary business characteristics for internationalization and in what way an entrepreneurial support system can aid small high-tech firms to commercialize knowledge (sub questions 1 and 2). The fundamental theories are chosen in this chapter. Chapter 3 will explain and justify the methods used, including its limitations. The actual analysis of the current situation begins in chapter 4, where the current characteristics of Technopark firms are displayed, in connection to any added value of characteristics of UT firms and potential fits between the two (sub questions 3 and 4). This provides a clear picture on what aspects are missing for successful international collaboration, both on individual firm level and a general level including all firms. Chapter 5 continues by elaborating on the entrepreneurial support system of MEPhI (sub question 5). This will provide insights into the extent to which the support system can fill the gaps for internationalization and what aspects could still be improved. Suggestions for improvements for the firms themselves and for the support structure are given in chapter 6 (sub question 6). The last chapter summarizes the report and answers the central question. The practical and theoretical value of the research will also be discussed, including its limitations and suggestions for further research.

Chapter 2: Theoretical background

As mentioned in chapter 1, this chapter introduces the theoretical framework for the rest of the report. The following sub questions will be answered:

1. 'What business characteristics enhance international collaboration between high-technology spin-off companies according to theory?'

2. 'How can an entrepreneurial support system add to these business characteristics for international collaboration according to theory?'

This chapter searches for a theory to describe and explain necessary business characteristics in international collaboration in the context of high technology and networks. The theory should clarify how different actors can add to the success of collaboration, as this research includes Technopark firms, UT firms and the MEPhI entrepreneurial support structure. The theory should provide the tools to give advice how MEPhI firms could develop to enhance their possibilities for international collaboration with help of the support structure. It should be sufficiently abstract to use the theory for different high technology sectors, but sufficiently concrete to provide guidelines on how to construct a collaboration. The model should have a broad focus, as I believe that many factors play a role in establishing or exploiting a collaboration.

Several theories on collaboration and internationalization are introduced, after which will be explained why the 4S model was chosen as the fundamental theory. A discussion will follow on what limitations of other theories it solves, although some limitations still remain. The second part of the chapter creates a model from the 4S model and an additional theory on entrepreneurial support to clarify how an entrepreneurial support system could add to the business characteristics in firms for international collaboration.

2.1 Collaboration

To survive in the current market place, firms must innovate in different sectors simultaneously because there is an increasing interdependence of technologies. Moreover, investments need to be recovered in a short time because of rapid technological change. Few firms can afford to do this alone, so collaboration must be considered (Narula and Hagedoorn, 1999). There is evidence of a strong relationship between collaboration and performance (Shrader, 2001). Collaboration is 'working together, over an extended period of time, for the benefit of both companies involved' (Middel et al., 2007, p. 225) that typically takes place within networks. Networks help to 'identify opportunities, enable and constrain the exploitation of opportunities, and bridge so-called structural holes' (Groen, During and Weaver, 2007, 5) and are 'critical for the growth of an entrepreneurial venture because they provide access to a variety of resources held by other actors' (Shaw and Shaw and Conway in Neergaard, 2005, p. 257). There are two motives to engage in interfirm collaboration, namely to economize costs and the strategic motivation aimed at long-term profit optimizing (Narula and Hagedoorn, 1999). There are various theories connected to collaboration.

2.1.1 The four Cs of strategic alliances

Strategic alliances are 'interfirm cooperative agreements which are intended to affect the long-term product market positioning of at least one partner' (Narula and Hagedoorn, 1999, p. 284). Zollo et al. (2002) define strategic alliances as 'cooperative agreements of any form aimed at the development, manufacture, and/or distribution of new products' (Zollo et al, 2002, p. 701). Brouthers et al.(1995) offered four considerations that should be met when establishing strategic alliances, which they called 'The four Cs of Strategic Alliances'. First of all, the partner needs to offer *complementary skills*, as the partners can have significant contributions to each other. A comprehensive search needs to be

done to find such a partner, where the examination should be focused on skills, technologies and markets. The companies should be willing to give as much as they receive. Secondly, there should be a *cooperative culture* between the firms. The key word is symmetry. It is necessary to have symmetry in size, financial resources, and peer relationships at the top level of management for an alliance to work. Furthermore, internal working environments should be comparable and there should be mutual trust. Brouthers et al. (1995) recognize the difficulty in finding comparable alliance cultures in firms from different countries. The third consideration of the 'four Cs of Strategic Alliances' is the necessity to have *comparable goals.* The alliance should satisfy the goals of both parties to be successful. The most ideal situation is when 'strategic coals converge while competitive goals diverge' (Lorange and Roos in Brouthers et al. 1995, p. 21). The challenge is to discover the real goals, as it is often argued that partners enter into alliances with hidden agendas (Duysters et al., 1999). The last consideration is to *commensurate levels of risk.* This is especially true for the high-techology sector, as firms can face major failure in this rapid changing market when they do not spread risks. Sharing risks could even be a motivation for starting a strategic alliance with competitors. It must be pointed out that the risk should be shared equally for an alliance to last (Brouthers et all, 1995). The 'four Cs of strategic alliances' offer clear guidelines on how a cooperation could be established in the best way and could easily be used to clarify the role of different actors in this respect. The theory could be used as a framework for this report, were it not that the ultimately chosen 4S model is more extensive, especially concerning social relationships. As will be seen at a later stage, the 4S model shows some striking resemblances with these 'four Cs'.

2.1.2 Transaction cost approach

The transaction cost approach is often used to examine the efficiency aspect of horizontal collaboration. In this theory, trade-offs between costs and benefits are optimized to decide whether to cooperate or to internalize, which varies with the type of knowledge that is transferred. Collaboration is only optimal under the right circumstances, and entrepreneurs tend to focus mostly on the benefits of collaboration than on the costs. The theory is founded on bounded rationality and the risk of opportunism. Bounded rationality means that it is impossible to fully understand all consequences of making a decision and influences transfer of knowledge across organizational boundaries. It is difficult to write and enforce contracts between firms because bounded rationality makes that it is impossible to fully understand all implications of a decision, and tacit knowledge is very difficult transmittable across organizational boundaries. Furthermore, the concept of opportunism implies that there is a risk in transferring knowledge, as others might behave in their own interest, using collaborative contracts for other purposes than originally intended (Shrader, 2001). This does not mean that everyone will act in this way, but that there is a risk that the other might behave opportunistically. The transaction cost approach focuses mainly on *what kind* of collaboration to choose, rather than *how* to enhance collaboration. In this way, it does not provide guidelines on how to construct the collaboration, or how different parties can have synergetic effects on each other. As this theory limits itself to the question whether to cooperate or to internalize, this approach is of less relevance for this research.

2.1.3 Shan's market failures

Shan argues that the motives to cooperate are correlated with the competitive position of the high-technology firm. 'The stronger the competition the more desirable are cooperative arrangements which speed up the commercialization process' (Shan, 1990, p. 134). Cooperative arrangements between companies are made because of two 'market failures'. First, there are transactional difficulties in obtaining specialized products and services, which could be resolved through internalizing. However, internalizing requires acquisition of assets in the market, subject to similar transactional problems. This is the second market failure. The choice to collaborate is based on minimizing transaction and production costs, in combination with maximization of long-term profitability through improvement of the competitive position, found in strategic behavior models. When there is no or little competition, collaboration is not fruitful as less needs to be invested, but

on the long run profit needs to be shared. This can be very costly as long-term profits are expected. The opposite situation occurs in high-technology markets, where there is severe competition and windows of opportunities are small. There is no time to stretch the time to market of the innovation until the company makes the investments itself. Sharing of profit is not as costly as shortened life-cycles are inherent in this sector (Shan, 1990). This model lays bare the motives for collaboration, but does not include any information on how collaboration could best take place. It does not provide the necessary tools to construct a partnership and does not explain what business characteristics are needed for collaboration to succeed.

2.1.4 Customer-supplier relationships in a larger network

This model analyses cooperation between suppliers and customers embedded in a larger network of relations. Although the starting point is a supplier-customer relationship, successful relationship coordination can lead to extensions of the relationship, to for instance joint product development. The profitability of a cooperation is indirectly enhanced when other business relations support the cooperation, and directly enhanced when there is commitment for the cooperation. It comes down to the fact that both parties should consider the dyad 'profitable or otherwise worthwhile' (Blankenburg Holm et al., 1996, 1035). Additionally, the relationship should have an informal character to limit uncertainties and possible opportunism. However, there is need for more research on international business relationships of firms from different countries to investigate the role of cultural distance on the cooperation process (Blankenburg Holm et al., 1996). The concepts used in this model are rather abstract, making it very difficult to measure them. In addition, it requires close investigation of third parties, which is undoable in the time available.

2.1.5 Resource based view

This view implies that 'differential endowment of organizational resources is an important determinant of strategy and performance' (Knight, 2001, p. 158). In this context, resources include 'all assets, capabilities, organizational processes, firm attributes, information, knowledge etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness' (Barney, 1991, p. 101). Through 'implementing strategies that exploit their internal strengths, through responding to environmental opportunities, while neutralizing external threats and avoiding internal weaknesses' (Barney, 1991, p. 99), firms can obtain competitive advantages, also in foreign markets. This theory is based on two main assumptions: firms are heterogeneous regarding their resources, and resources are not perfectly mobile across firms, making heterogeneity long lasting (Knight, 2001). Sustained competitive advantage of a company is possible through the possession of resources that are valuable, rare, imitable and non-substitutable. In collaboration, firms can complement each other in their resources in order to achieve a joint competitive advantage over others in the industry. A limitation of this approach is that it is primarily focused on the firm's assets and capacities rather than on industry structure and strategic interactions among competitors. Furthermore, it explains *what kind* of resources are needed to obtain competitive advantage, but it does not explain *how* to obtain these resources and argues that all resources are good by itself, as long as they comply to the previously mentioned characteristics.

2.2 Internationalization

As this research does not only focus on partnerships, but on internationalization, it is important to have a theoretical background on this, too. International entrepreneurship is 'the discovery, enactment, evaluation, and exploitation of opportunities across national borders to create future goods and services' (McDougall and Oviatt, 2003, p. 7). In traditional research, internationalization of companies was considered to be a gradual process in which the firm was to establish a stable domestic position first before entering foreign markets. In the past decade it has become apparent that many firms start international activities from birth, including targeting distant markets, multiple markets simultaneously and forming joint ventures without experience. Rasmussen (2002) explains this trend by stating that there are 'more global market conditions, new developments in

transportation and communication technologies, and a rising numer of people with international experience' (Rasmussen, 2002, p. 4). It is very important that the management is commited to internationalization (Rasmussen, 2002, p. 8). Oviatt & McDougall at to this by stating that there is increasing 'homogeneity of markets, emergence of international financing opportunities, and emergence of increasingly internationally mobile human capital.' (Oviatt & McDougall in Autio and Sapienza, 2000, p. 6). These conditions make it very attractive for (knowledge intensive) start-ups to internationalize at, or soon after, inception.

Johanson and Vahlne (1977) and Knight (2001) are among the authors who have engaged themselves with international collaboration.

2.2.1 Uppsala model

The Uppsala model states that initial internationalization activities take place in physically close markets, and that the less committed modes of entry, such as exporting, are used. The firm learns and international market knowledge and experience increase, leading to an increase in commitments to the foreign market and targeting to physically more distant markets. This model is very positive about internationalization and does not question the constraints of international partnerships, as other theories such as the transaction costs approach do.

The Uppsala model does not consider more rapid internationalization of firms because of accelerating technological changes and the degree of regional and global integration of trade and production. Especially the first point is of relevance in this study on high-technology spin-offs. Furthermore, the phenomenon of global start-ups cannot be explained with this model. Last, McDougall and Oviatt discovered that the network of the company 'appeared to have more influence on the founders' country choices than did their physic distance' (McDougall and Oviatt, 2003, p. 14). The authors themselves agree that there is a need to integrate this model with a new and more network-based model of internationalization (McDougall and Oviatt, 2003, p. 12). What is more, the model is rather describing than prescribing, and offers no guidelines for setting up international partnerships.

2.2.2 Model on international performance

Knight created a model on international performance, in which internationalization of SMEs is facilitated by orientation and strategies, leading to performance. Orientation is the basic culture of the firm, which is the 'dominant pattern of beliefs and values' (Knight, 2001, 159). Strategy can be divided into strategic competence, technology acquisition and internationalization preparation. International entrepreneurial orientation is fundamental, as it enhances the three components of strategy. These, in turn, are responsible for international performance. Next to this, strategic competence is enhanced by the two other aspects of strategy, namely internationalization preparation and technology acquisition (Knight, 2001). This model could provide assistance into how companies could improve their international performance, but does not clearly include the network and is not very broad as it is mostly focused on strategies.

Research on international entrepreneurship seems to be conducted either by entrepreneurship scholars, or by international business scholars. It is suggested that collaborative research on this topic by scholars from both disciplines could lead to fruitful insights (McDougall and Oviatt, 2003, p. 19). Furthermore, both theories previously mentioned do not fully include the network aspect of internationalization, whilst that aspect is of major importance in this research.

2.3 Theory choice

It was pointed out that the theory has to describe and explain characteristics that the firms should possess in order for them to internationalize successfully. It should provide tools to construct successful collaboration, in which there is space for a partner and an entrepreneurial support system

to fill any gaps. This means that the concepts should be sufficiently concrete to offer a good instrument, and sufficiently broad to include all aspects of doing business. It is my opinion that the 4S model fits these prerequisites best. Although the chosen 4S model is not specifically meant for international contexts, there are no reasons to believe that it cannot be used for this purpose. First, the reasons for choosing this model will be outlined. Then, the model will be explained in detail. Afterwards, the limitations will be explored.

2.3.1 Justification of chosen theory

The most important reason for choosing the 4S model over other theories, is that it clearly provides guidelines on how cooperation could be optimized and how actors can have synergetic effects on another actor, and vice versa. In this way, it provides an instrument to construct a partnership. This was also the case in the 'four Cs' theory, but this is not as broad as the multi-dimensional 4S model. Both theories understand the importance of having comparable goals, but only the 4S model speaks about the possibilities to attain the desired goals. Further, the 'four Cs' do not include the social network aspect and what resources to attract from them as much as the 4S model does. In a similar vein, the Uppsala model and Knight's theory on performance excluded network aspects. The 4S model goes beyond the question whether or not to cooperate, where transaction cost theory and Shan's market failures stop. It is not sufficient to know whether or not to cooperate, but *how* this cooperation should be constructed for it to succeed. As said before, the 4S model does provide the means to do this. Another discussed theory was the resource based view. This is a rather static theory, but the multidimensional world makes that resources and capitals are often interlinked and cannot be separated. Therefore, much confusion can be taken away by focussing on capitals rather than resources. The 4S model is 'a theoretical scheme useful for analyzing concrete streams of actions in organizational context' (Groen, Kraaijenbrink and Heuven, 2007, p. 22). The 4S model specifically addresses the effects of actor's interactions with other actors and the level of analysis depends on the research questions at hand. The theory is multidimensional as it strikes a balance between the four capitals. This is better than focussing on economic or strategic capitals as in other theories, as these are often lacking in developing firms. Last, the 4S model is very informative because it offers the possibility to investigate what types of capitals are present in the firms, and which are present in the firm's network. According to this information, managers can decide what capitals need to be developed further (Groen, Kraaijenbrink and Heuven, 2007).

2.3.2 The 4S model

The 4S model is based on the social system theory of Parsons, who defined a social system as follows:

"… a social system consists in a plurality of individual actors interacting with each other in a situation which has at least a physical or environmental aspect, actors who are motivated in terms of a tendency to the 'optimization of gratification' and whose relation to their situations, including each other, is defined and mediated in terms of culturally structured and shared symbols."

(Parsons in Groen, 2005, p. 5)

This definition of a social system is based on two main assumptions. Firstly, it is assumed that actors act purposefully in interaction with other actors. The second assumption is that capitals are both inputs and outputs of an action, which is depicted in figure 2.1. (Groen, Kraaijenbrink and Heuven, 2007).

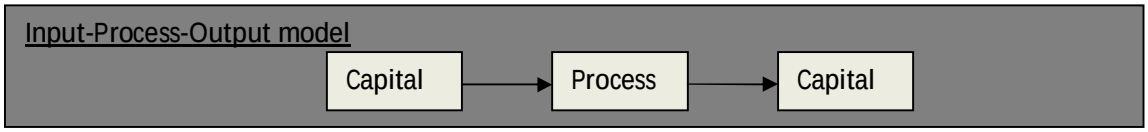

Figure 2.1: Input-Process-Output model

There are four functions that are necessary for a social system to last:

1. Optimization of gratification. This refers to the set of goals of an actor as mission and strategy. The process of creating this mission and strategy can be defined as the process of opportunity recognition, opportunity exploration and opportunity exploitation.
2. Economic challenge of allocation of scarce resources. This leads to more efficient processes.
3. Culturally structured and shared symbols. To have regulation of exchange it is essential to have a pattern maintenance function.
4. Interaction with others. What ego gets is also dependent on the actions of alter. To survive, there must be a certain level of integration of joint actions.

(Groen, 2005) and (Groen, Kraaijenbrink and Heuven, 2007)

The above mentioned functions can all be translated into the four dimensions of scale, scope, skills & values and social network, leading to strategic, economic, cultural and social capital respectively, that should occur in each of the entrepreneurial phases: opportunity recognition, opportunity exploration and opportunity exploitation. Appendix two provides a short summary of relations between dimensions, capitals and resources. Value is created through this process. Each capital contributes to the performance of the company and none of the four is determining (Groen, 2005, p. 79). This process is depicted in figure 2.2. It could be said that 'differences in acquiring the four types of capital explain differential performance of entrepreneurs' (Groen, During and Weaver, 2007, 2).

4S in value creation

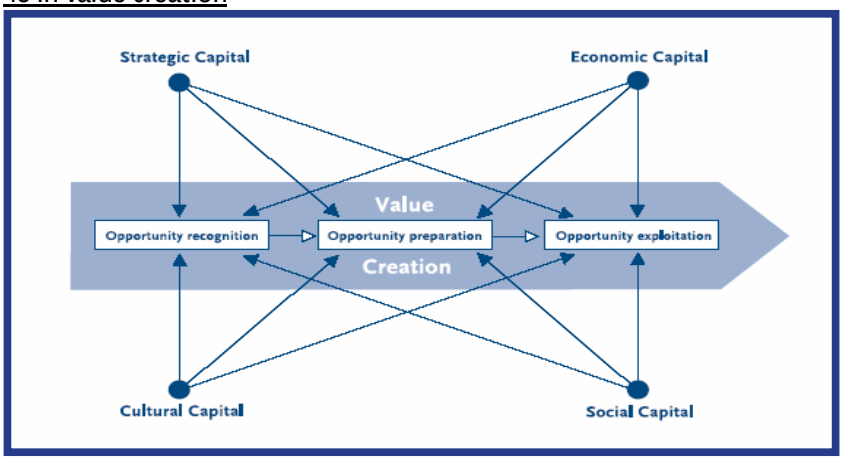

Figure 2.2: 4S in value creation (source: Sijde et al., year unknown).

Scope (Strategic capital)

This is the capacity of an actor to define goals and to control resources and other actors with the aim of achieving these predefined goals through power, influence and authority. It comprises the company's processes of making sense of its existence and 'aiming at realization of certain possibilities to exploit' (Groen, During and Weaver, 2007, 3). Strategic capital can reside in people, but also in artifacts. Examples of artifacts are patents or technical innovations that have become standardized (Groen, Kraaijenbrink and Heuven, 2007).

Scale (Economic capital)

This is a 'set of mobile resources that are potentially usable in exchange relationships between the actor and its environment in processes of acquisition, disposal or selling' (Groen, Kraaijenbrink and Heuven, 2007, 19). The resources are not tied to one goal. It comes down to seeking the efficient scale for operations, or trying to become more efficient than competitors, by using money (Groen, Kraaijenbrink and Heuven, 2007).

Skills & Values (Cultural capital)

This is 'the set of values, norms, beliefs, assumptions, symbols, rule sets, behaviors and artifacts defining the actor with respect to other actors and the environment' (Groen, Kraaijenbrink and Heuven, 2007, p. 21), or pattern maintenance. It means that knowing how to do things effectively and efficiently leads to a fixed pattern of skills, and certain behaviors, values and methods of dealing with certain situations are supported whereas others are not in terms of the goals set by the company. Cultural capital is immobile and specific to the relation (Groen et al., 2002).

Social network

Social capital is 'the set of network relations through which actors can utilize, employ, or enjoy the benefits of capital that is controlled or owned by other actors' (Groen, Kraaijenbrink and Heuven, 2007, 20). The ability to interact with others within and beyond the organization leads to social capital as interaction patterns get meaning through the social integration of scope, scale and skills of the actor. So the three previously mentioned capitals are the content and mechanisms for the actor to perform in a social network (Groen et al., 2002). There can be too much and too little of social capital. Too little social capital leads to problems in obtaining necessary resources, to much leads to stifling of growth. Therefore, social capital should be optimized, not maximized (Woolcock, 1998).

To prevent misunderstandings, it is of importance to note the difference in definition of social capital in the 4S model and in other theories. Many scientists define social capital as anything you get through the network (Nahapiet & Ghoshal in Audretsch and Monsen, 2007), (Bourdieu in Loohuis, 2007) and (Edwards and Foley in Woolcock, 1998). The 4S model defines social capital as the network itself, through which it is possible to obtain strategic, economic, cultural and other social capital.

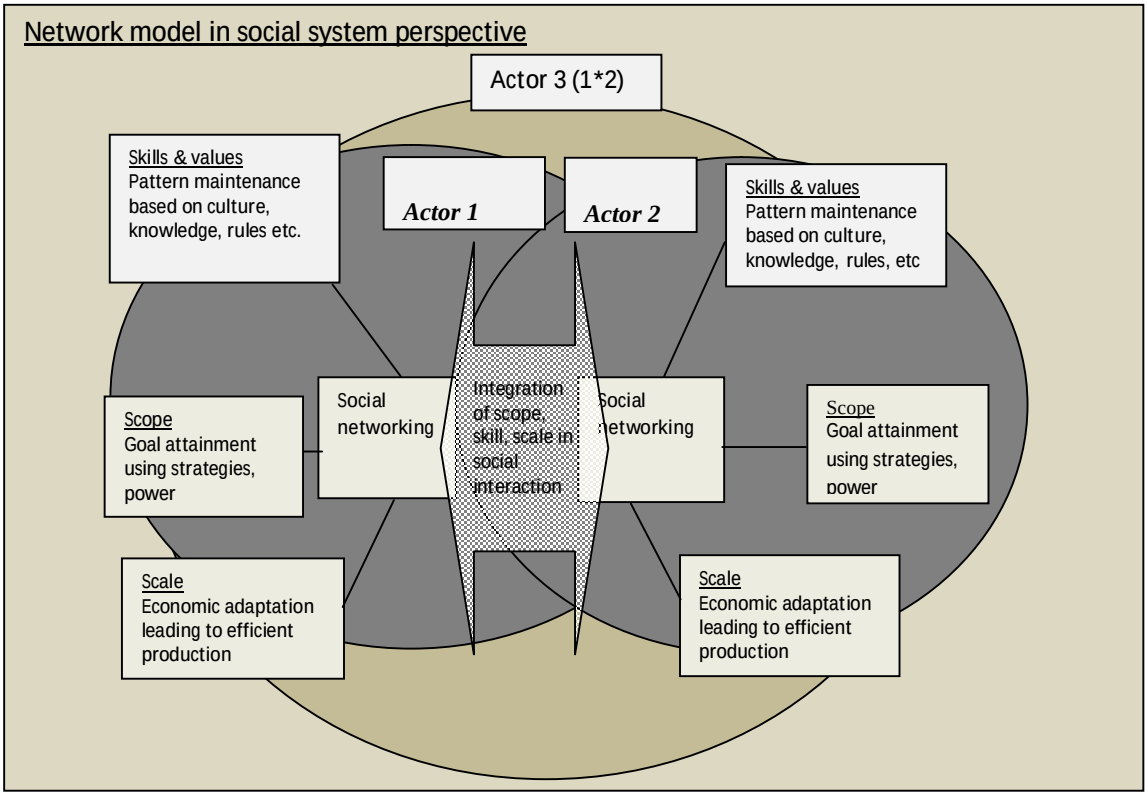

Figure 2.3: Network model in social system perspective. Source: Groen et al., 2002, p. 5

Analytically, it could be stated that the capitals are mutually exclusive. However practically, the world is multidimensional and the capitals cannot be separated. The above can be put into a model

depicted in figure 2.3 that is multi-dimensional, multi-level and dynamic. All dimensions are interrelated and any change in function will affect another function. To prevent constraints, all functions within a company and between collaborating companies should be compatible with each other. Furthermore, it is assumed that a social system can only last when all four functions are developed sufficiently above a certain threshold value in the stages of opportunity recognition, opportunity preparation and opportunity exploitation. More research is needed to define this threshold value, which is supposedly context-specific. It is also hypothesized that entrepreneurs with more capital perform better than those with less capital (Groen, 2005). Next to this, resources related to one kind of capital could also be used for another kind of capital. An example is money, which is usually related to the economic capital. However, when other actors are also dependent on this money, it also relates to strategic capital through the power that it offers. Use of resources is important in explaining to what capital it belongs. Finally, the capitals should be maintained over time, where a balance is struck between short and long term (Kerssens-van Drongelen and Groen, year unknown).

According to Middel et al. 'continuous improvement in the performance between partners in a network of organizations' need to take place (Middel et al., 2007, p. 222). In accordance to the 4S model, all mechanisms should be used successfully and should be developed sufficiently. In the scope dimension, actors are motivated to attain not only their own goals, but also improve the performance of the entire network. A shared vision that is understood by all parties is an essential prerequisite. This collaboration should be structural and proactive processes rather than ad-hoc problem solving. Regarding the scale dimension, there should be interaction between, and integration of, inter-company processes, as internal processes are increasingly linked with external suppliers and customers. In the skills & value dimension it is important for continuous improvement to have a 'shared belief in the value of small improvements and the creative potential of actors'. One should build upon the knowledge of the other company to minimize actions needed in future initiatives. In the social dimension there should be interaction with each other on different levels, both internally and externally. It is not sufficient to focus on improvement related problems, but there should also be attention for 'creative improvements' (Middel et al., 2007).

2.3.3 Limitations of theory

Although the 4S model seems the best choice for this research, limitations remain. The capitals have been operationalized in many different ways, making it very difficult to generalize results. This lack of standards challenges the choice of operationalizations in this research, that need to be well justified and elaborated upon to explain why certain indicators are chosen and in what contexts these can and cannot be used. Chapter 3 will clarify the choices made in this respect. Next to this, it is not yet known what the threshold value is of the capitals and if capitals need to be of equal size. Connected to this, it is not known what factors influence this threshold value. Further research needs to be done on the previously mentioned topics. Furthermore, it should be taken into account that objective measures differ in their contribution to a certain capital in a different context, adding to the complexity of the theory. There is a special difficulty in the Russian context. Entrepreneurship in Russia is embedded in a hybrid of markets and hierarchy, leading to parallel structures where the same amount of capital can lead to different values (Batjargal, 2000). This plays a role in comparing the capitals of Russian spin-offs with UT companies with each other, where the same possessions of resources can lead to different weight in strategic, economic, cultural and social capital. The 4S model has so far not explicitly mentioned this problem. This research can be used to underline the possibility for further research in this respect, but this does not mean that the 4S model cannot be used. In this research, the focus is on compatibility between capitals of different companies, not about the likelihood of the firms to survive in a social system. In this way, not knowing threshold values of capitals does not pose a problem.

2.4 Specifications of 4S model

In order to actually use the 4S model in this research, the four dimensions need to be operationalized. This is done with help of additional theories, previous researches from NIKOS, Dervojeda (2006) and Loohuis (2007), and background information from Kerssens-van Drongelen and Groen (year unknown), and Groen, Jenniskens and van der Sijde (2005). This section will provide the details per dimension. All specifications are summarized in figure 2.4. As can be seen in figure 2.4, the first orientation point to look for possible partnerships is the strategic dimension. If the strategies of both potential partners are compatible with each other, it could be investigated if the other dimensions also align. Furthermore, it needs to be investigated if both parties are willing to cooperate, reflected in the perceived attractiveness dimension.

2.4.1 Scope

The typology of Miles and Snow is used to identify the type of strategy of the company with respect to innovation. This means that the firm can either be a prospector, a defender, an analyzer or a reactor. A prospector 'aims to innovate, take risks, seek out new opportunities and grow', which is a suitable strategy in a dynamic, growing environment. A defender is mostly concerned with stability and internal efficiency, which can be justified in a declining industry or stable environment. Analyzers 'maintain a stable business while innovating on the periphery', as they try to balance stable production of current product lines with creative new development. The last strategy is that of the reactor who 'responds to environmental threats and opportunities in an ad hoc fashion', which actually indicates a lack of long-term plan or explicit mission or goal (Daft, 2004, p. 62-63).

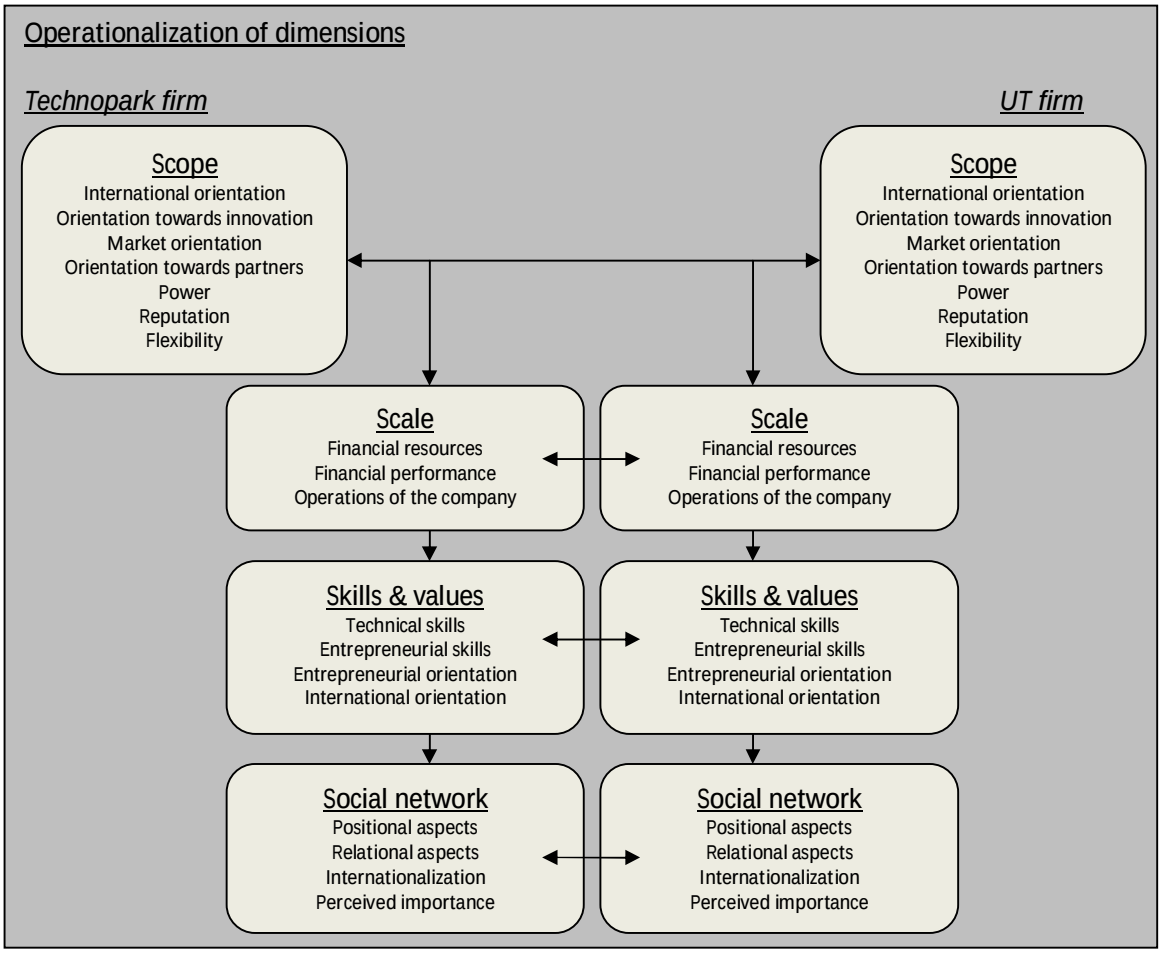

Figure 2.4 Operationalization of dimensions

Furthermore, Narver and Slater imply that 'a study comparing the strategic profiles of different orientations would be interesting and useful to their more complete understanding' (Slater and Narver, 1996, 170), which is why different strategic orientations are included in the operationalization. There are five orientations: towards innovation, competitors, suppliers, alliance partners and customers. Orientation towards suppliers is not considered of relevance in this research, which is why it is excluded. International orientation is included, as it is useful to know to what extent the firms have the intentions to internationalize. The orientations towards competitors and customers are combined into marketing orientation. The MKTOR instrument is chosen because this scale and the MARKOR scale of Kohli et al. (1993) are the current state-of-the art in measuring market orientation, while Oczkowksi and Farell (1998) concluded that the MKTOR scale is better in explaining differences in business performance (Van Raaij, 2001).
Kerssens-van Drongelen and Groen operationalize strategic capital by means of looking at the percentage of goal alignment between the firm and its stakeholders. It is beyond the scope of this paper to cover this area. The outcomes of the strategic capital could rather be used to judge goal alignment between the Technopark firm and the UT company. The other factors of Kerssens-van Drongelen and Groen are used, which are power, reputation and flexibility (Kerssens-van Drongelen and Groen, year unkown). It can be said that these operationalizations include two interpretations of strategy: what is the strategy of the firm, and what is the capability of the firm to obtain the desired goals.

2.4.2 Scale
The scale dimension is divided into three factors, based on the questionnaire of Loohuis (2007) on networking capabilities in the aviation industry, and the questionnaire of Dervojeda (2006) on scouting and screening processes at the UT. These factors are financial resources, financial performance and operations of the company.

2.4.3 Skills & values
The skills and values dimension is based on Groen, Jenniskens and van der Sijde (2005), and Lumpkin and Dess (1996). According to Groen, Jenniskens and van der Sijde, successful high-tech companies should possess technical skills and entrepreneurial skills. Entrepreneurial skills can be divided into marketing, business administration and organization and financial management. These skills do not need to reside in one person, as long as the founding team and employees together possess these skills.

The values of the company can be assessed by the entrepreneurial orientation, which could be divided into four dimensions according to Lumpkin and Dess (1996). These are innovativeness, risk taking, proactiveness, and competitive aggressiveness. Innovativeness reflects the firms' 'tendency to engage in and support new ideas, novelty, experimentation, and creative processes that may result in new products, services, or technological processes.' Risk is 'the degree to which managers are willing to make large and risky resource commitments.' Proactiveness can be defined as 'acting in anticipation of future problems, needs, or changes'. It relates to market opportunities. Besides taking initiative in this sphere, a firm should also be responsive to its competitors. This relates to the last dimension of competitive aggressiveness, defined as 'a firms' propensity to directly and intensely challenge its competitors to achieve entry or improve position, that is, to outperform industry rivals in the marketplace' (Lumpkin and Dess, 1996, 142-148).

Of course, international orientation also needs to be included in this dimension to investigate to what extent the firms are ready to internationalize. They need to have proper education or experience, to know how to function properly.

2.4.4 Social Network

For this dimension, Brass' typical social network measures of ties are used. These measures can be divided into two kinds of aspects of networks, which is similar to operationalizations made by Kerssens-van Drongelen and Groen, namely positional and relational aspects. Indirect links, multiplexity, direction and symmetry relate to positional aspects, whereas frequency, stability and strength of ties are about relational aspects (Brass in Monge and Contractor, 1998). Indirect links mean that two actors are connected to each other through another actor. Multiplexity is the 'extent to which two actors are linked together by more than one relationship', direction relates to links that run one-way, and symmetry relates to links that are bi-directional. Frequency indicates how often a link occurs, stability says something about the 'existence of the link over time', and strength of a tie is 'the amount of time, emotional intensity, intimacy, or reciprocal services' (Brass in Monge and Contractor, 1998, table 1, appendix). Next to the above, the degree of internationalization of the current networks also needs to be taken into account, as well as the perceived importance of the current network.

2.5 Entrepreneurial support structure

It was pointed out that the Technopark firms, the UT companies and the MEPhI entrepreneurial support structure combined are responsible for successful internationalization of Technopark firms. For this reason, it is essential to have a theoretical background on entrepreneurial support systems that can easily be integrated with the 4S model. A theory needs to be found that does not specify *what* needs to be supported, but *how* the operationalizations of the four dimensions can be supported. Part of the theory of Broekstra et al. (2002) can be used for this purpose.

Broekstra et al. (2002) developed a quality assessment model for university spin-offs, adapted from the European Foundation of Quality Management (EFQM) model. This model shows that there should be integration of external and internal aspects of the spin-off programs. The enablers policy & strategy, organization, human resource management and the financial management of the program are responsible for certain processes. These processes are marketing & promotion, recruitment of entrepreneurs, intake and first selection, support of entrepreneurs, and purchasing. These processes have internal, external and societal impacts, leading to key performance results. The enablers learn from the results.

It its entirety, this model is too broad to include in this research and would go beyond the scope of the project. Only one aspect is of relevance, which is the process of supporting the entrepreneurs. The activities for effective support of entrepreneurs should support the four dimensions that were previously operationalized. In this way, the model that is depicted in figure 2.5 can be created. The activities above the arrows indicate *how* to support, whereas the dimensions underneath the arrows indicate *what* should be supported. Once the specific needs of the Technopark firms have become apparent after research, there is no need that the activities of the entrepreneurial support structure support all of these dimensions. After analysis, the model will only include those dimensions underneath the arrows where the companies need special support. The model is depicted as a helicopter for the reason that all dimensions are interrelated and change in one dimension leads to an increase or decrease in another dimension. It is a domino effect without beginning or end.

Not only did Broekstra et al. (2002) suggest necessary support activities, they also created a list on what is necessary, preferable or a good idea to facilitate these activities. This list can be found in appendix 6.

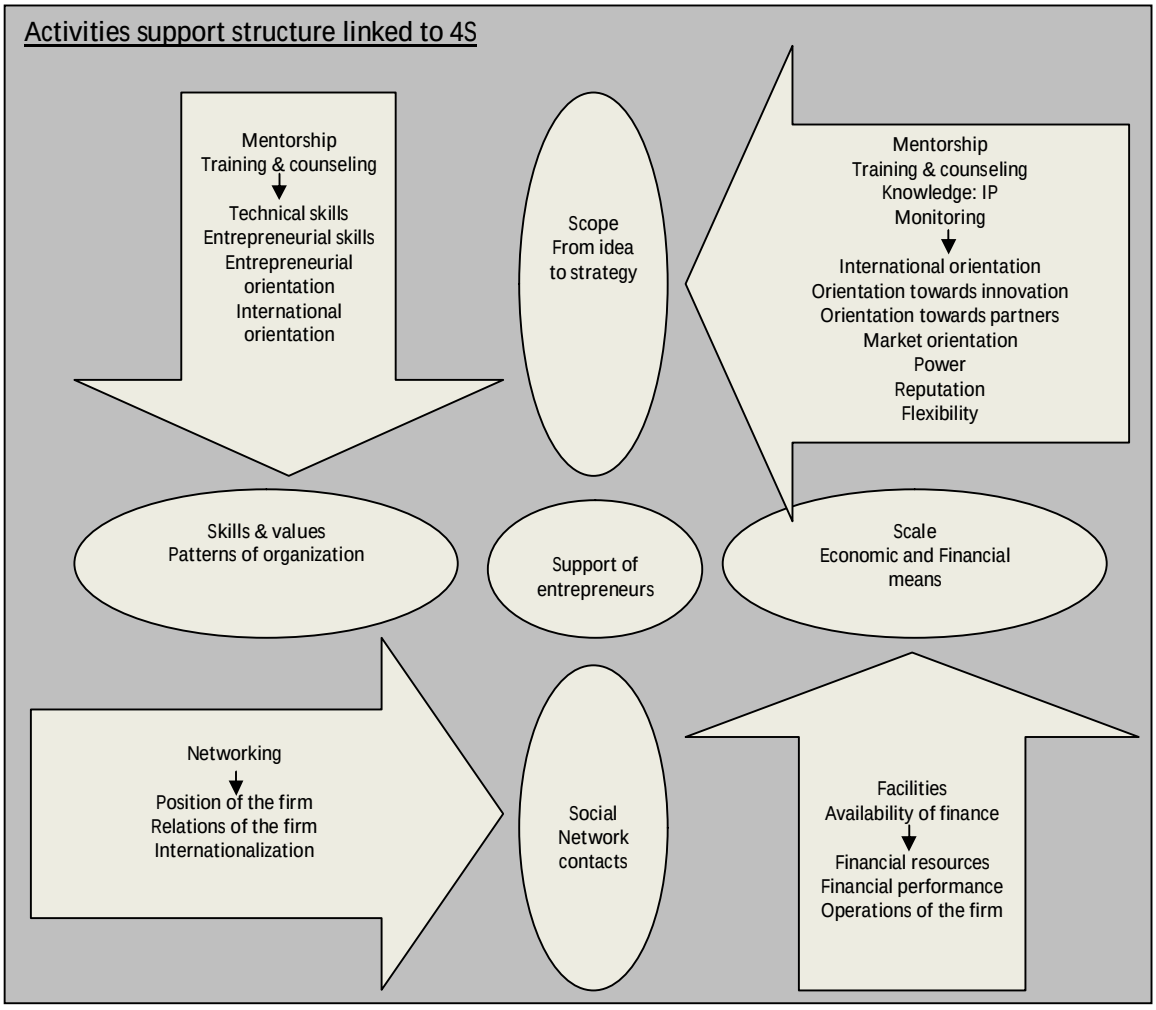

Figure 2.5: Activities support structure linked to 4S

Mentorship

The mentor is somebody to whom the entrepreneur can turn with questions and problems, and can be found inside or outside the university. Mentors from the field of business that the entrepreneur is entering can offer 'specific experience and advice', whereas mentors from the university 'can share with the entrepreneur their experience in the field of science in which the spin-off business is operating' (Broekstra et al., 2002, 32).

Monitoring

In order to give the right support, development of the firm should be monitored. The business plan should be the basis of regular meetings between the entrepreneur and the program to evaluate progress made. It is useful to set short-term objectives that should be met, and need to be discussed at the following meeting. A special monitoring team could be assigned to evaluate firm progresses.

Training and counseling

The training and counseling offered should follow the needs of the firms, in order to add value. It is advisable to provide trainings in technical, but also in entrepreneurial subjects. The same counts for training in creating the business plan. Besides training, counseling should be given on training opportunities and on marketing and other business topics.

Networking
As networking is of the utmost importance to acquire necessary resources, the support structure should aid in connecting entrepreneurs with other actors. This could be done through organizing regular meetings.

Knowledge: Intellectual Property
As knowledge is one of the main assets for spin-offs, the entrepreneurial support structure could make knowledge accessible to them. This counts for informal knowledge and embedded knowledge such as patents or licenses owned by the university. Sharing of knowledge needs to be facilitated.

Availability of facilities
As spin-offs face financial challenges in their initial stages of existence, they do not have the means to purchase all facilities needed. A spin-off program should offer facilities such as laboratories, office space, instruments and equipment. Facilities could be shared to increase efficiency.

Access to finance
As it is very difficult for start-ups to obtain money, the entrepreneurial support structure should provide assistance. There could be financial arrangements with the spin-off program or the university, or they could arrange contacts with business angels, informal investors or venture capitalists.

2.6 Conclusion

In this chapter, two sub questions were answered. Several theories were discussed that were not as suitable for this research as the chosen 4S model. Transaction cost approach and Shan's market failures mainly focus on when and why to collaborate, but not how this is done. The theory on customer-supplier relationships in a larger network provides practical problems and the resource based view is too static. The Uppsala model and Knight's model on international performance do not sufficiently include the network aspect of the study. The four Cs of strategic alliances was very suitable, but not as broad as 4S, although there are some striking similarities between the two theories. The four Cs do not include goal attainment and social networks and connected resources are not as prominent as in 4S.

The business characteristics that enhance international collaboration between high-technology spin-off companies are reflected in the 4S model. The scope, scale, skills and social network of partners have to be compatible with each other in order for a cooperation to succeed. Furthermore, the partnership needs to have sufficient strategic, economic, cultural and social capital in order to survive. If one partner does not have sufficient capital in one of the four dimensions, the other partner can fill this gap. The entrepreneurial support structure can add to these business characteristics through including specific activities into the spin-off program that lead to support in the four dimensions, such as mentorship, training & counseling, networking and providing access to finance.

Now that the theoretical background has been clarified, the following step is to construct methods to use these theories in analyzing the business characteristics of Technopark firms, to assess the compatibility of Technopark firms with UT firms, and the possibility of the MEPhI entrepreneurial support structure to fill remaining gaps in potential collaboration. Chapter 3 will clarify the methods used.

Chapter 3: Methods

In this chapter, the used research methods are explained. First of all, there is a section on the general methods after which the methods per sub question are discussed. Last, the limitations of used techniques will be presented in order to judge the level of reliability and validity of the research.

3.1 General methods

3.1.1 Case study

This research is a multiple case study, as it 'attempts to examine a contemporary phenomenon in its real-life context' (Yin, 1981, p. 59). It is an intensive study of firms in a specific context, namely Technopark and the University of Twente. It is a qualitative study, as it is important to gain deep understanding of how the companies function and what support is offered to be able to provide recommendations for international collaboration. The units of analysis are ten Technopark firms, four UT companies and one MEPhI entrepreneurial support structure, measured through individual entrepreneurs and experts on MEPhI entrepreneurial support instruments who are the units of observation. Detail is deliberately chosen over generalizability. The research results need to be useful to MEPhI and Technopark and its participants rather than to other Technoparks.

3.1.2 Research activities

Several research activities are used to obtain the necessary information. Theoretical questions are answered through desk and literature search. The more practically oriented questions are answered through desk research and interviews. Desk research is the first step in getting acquainted with the units of analysis, but does not offer enough detailed information to say anything sensible on business characteristics of Technopark firms and UT companies, or on the provided support from the support structures with respect to international collaboration. Very specific information that is needed can only be retrieved through in-depth interviews. Interviews are flexible, and open-ended questions are possible. In this way, much valuable information can be obtained that could not be foreseen. Furthermore, through personal contact it is possible to judge the quality of the response and the context of the study can be elaborated upon as the interviewee wishes, making this person more committed and more likely to cooperate. All of these features are more difficult when using a questionnaire.

3.2 Methods per sub question

Sub questions 1 and 2 were already answered in chapter 2. The methods for the remaining questions are elaborated upon in this section.

3.2.1 Sub question 3: 'To what extent do Technopark firms possess the necessary characteristics for international collaboration?'

For this question, a selection of firms needed to be made. To create a research that is substantial enough to give recommendations that can be used by all Technopark participants, it is necessary to include as many companies as possible. On the other hand, time limits and practical issues make it impossible to include all 25 Technopark firms. In accordance to the wishes of the director of Technopark, it was agreed to include ten companies in the study. The sectors of operation were to be limited to two or three to create a manageable situation where the needs and possessions of capitals are more likely to be similar than when ten different sectors were studied. A brochure on all Technopark firms was used to make selection choices, in combination with consultations on entrepreneurial activity in Twente to choose sectors in which chances for collaboration would be higher. The final selection was altered by the director of Technopark, who had reasons to exclude several firms, and to suggest others. In this way, it was not possible to stick to only three sectors. This has benefits as well, because the level of generalizability of results to other Technopark participants

increases. The ultimately chosen firms are Aleksandr+, Aquaservice, Eniko TSO, Eskiz MEPhI, Lekis, Lidasa, MEPhI Ineco, OKC Service, Quarta-Rad, and Teros MEPhI. A factsheet of these firms can be found in appendix 7. After study of these ten companies it became apparent that Aleksandr+, Aquaservice and Eniko TSO were not interested in internationalization.

The interviews with firms in Russia were conducted by me and by students of the faculty of Innovation Management of MEPhI. The initial idea was to conduct multiple interviews per company, making it impossible for me to do this by myself in this short period of time. Furthermore, these students needed to do an assignment before participation in a special project between MEPhI and UT, which is beyond the theme of this paper. However, the directors of the firms were not willing to let us interview employees, making this study vulnerable to single informant bias. The interviews were designed to reflect the operationalizations of the four dimensions as discussed in chapter 2. An interview protocol was designed to clarify the purposes and order of questions to the students, to be found in appendix 3a. In relation to this, a scheme was created to show what question belongs to which operationalization, as can be seen in appendix 3b.

As said before, the scope dimension is divided into international orientation, orientation towards innovation, market orientation, orientation towards partners, power, reputation, and flexibility. The indicators for each operationalization are summarized in figure 3.1. To measure market orientation, the MKTOR scale of Narver and Slater is used. Originally, the MRKTOR scale includes interfunctional orientation (Narver and Slater, 1990). This is only of importance for big firms where different departments need to align their strategies with each other, but of no use for the small firms of Technopark or UT. Interfunctional orientation is therefore left out. In this scale, the firms could grade several statements on a scale from 1-7, or 0 if they did not know the answer or if the question was irrelevant. The numbers were added and divided by the number of questions answered. In connection to this, the firm's opinion on its market orientation was asked, making comparisons between actual and perceived orientation possible. This is the triangulations process. Furthermore, there were questions about competitive advantages and firm philosophy. The orientation towards partners is indicated by the degree to which goals of partners are taken into account when designing a strategy. Questions on intellectual property, standardized products in the market, influence of customers and influence over suppliers indicate the level of power of the firm. Reputation was measured through publications, participation in congresses and exhibitions, and whether or not other firms stay informed about the activities of the company. Last, flexibility was indicated through adaptations of strategy because this was better for another network partner.

The scale dimension was divided into financial resources, financial performance, and operations of the company. First of all, the financial resources are measured to reflect the funding of the company, and to see if there are sufficient financial resources. Secondly, the financial performance will be measured to indicate the financial capabilities and size of the company. Thirdly, the operations of the company are examined to see what the firm does with its resources, and if operations are efficient. The indicators per operationalization can be found in figure 3.1

Technical skills, entrepreneurial skills, entrepreneurial orientation and international orientation are used in the skills and values dimension. Again, the indicators for these are reflected in figure 3.1. The instrument of Lumpkin and Dess was used to measure entrepreneurial orientation, where Likert-scale questions indicate the level of innovativeness, risk taking, proactiveness and competitive aggressiveness. In every dimension, the numbers are added and divided by number of questions in this dimension to calculate the degree of entrepreneurial orientation.

The social network dimension was divided into positional and relational aspects, perceived importance, and the level of internationalization. Figure 3.1 shows the indicators for these

operationalizations. It has to be realized that it is extremely difficult to create a picture of the larger network.

Measurements			
Dimension	Operationalization	Indicators	Remarks
Scope	International orientation	Foreign goals, Protection intellectual property abroad, International standards, International conferences	
	Orientation towards innovation	Type of strategy (Miles and Snow), Preferred type of innovation	
	Market orientation	MRKTOR (Narver and Slater), Competitive advantages, Firm philosophy	Interfunctional orientation was excluded from MRKTOR
	Orientation towards partners	Taking goals of partner into account in strategy	
	Power	Possession of IP, Standards in industry, Influence of customers, Influence over suppliers	
	Reputation	Publications, Participation congresses & exhibitions, Other firms stay informed or not	
	Flexibility	Adaptations of strategy for partner	
Scale	Financial resources	Human assets, Facilities, Funding	
	Financial performance	Return on investments, Revenues, Profits, Forecast in 5 years	
	Operations of the company	Efficiency, Most money spent, Areas to cut costs, Using investments of others	
Skills & values	General	Educational backgrounds, Refreshments courses	
	Technical skills	Number of technical employees, Technical background director	
	Entrepreneurial skills	Education in marketing, finance, business administration, Adequacy in marketing, finance, business administration, Having another company	(for business administration)
	Entrepreneurial orientation	Lumpkin & Dess	
	International orientation	Education in international management, International experience, Adequacy in international management	
Social network	Positional	Picture current network	
	Relational	Picture current network, Important ties, Duration of relationships, Frequency of contacts	
	Perceived importance	Importance of network, Importance of firm to network, Willingness to share resources	
	Internationalization	Foreign contacts, Efforts to establish foreign contacts, Importance of international network	

Figure 3.1: Measurements

When the Russian firms were interviewed, it was not yet known to what Dutch firm they could be linked. For this reason, they were asked what kind of partner they would like with respect to function, size, commonalities with the firm and prerequisites, as can be seen in appendix 3. This means that questions on perceived importance of the Dutch partner to the Russian firm is integrated into the other indicators.

3.2.2 Sub question 4: 'To what extent can characteristics of UT firms add to the characteristics of Technopark companies for international collaboration?'

Selection of UT firms occurred partly through self-selection. The director of the Technologie Kring Twente (TKT) sent an inquiry to members of TKT, Business and science park Twente and the TOP program if they were interested in any of the remaining sevens Technopark firms with international aspirations. In addition, consultations with experts on entrepreneurial activity in Twente gave suggestions on what firms might be suitable for potential collaboration. During this process, it was pointed out that there were little chances for two Technopark firms. Lekis was too broadly oriented and the used technologies of Teros MEPhI were completely unclear. After this, desk research was done on the UT firms to compare activities and strategies with the remaining Technopark firms, in accordance to the model presented in figure 2.4. The ones with chances of success were contacted for interviews to obtain the necessary in-depth information. In order to make these interviews more concrete and useful, a possible fit between specific companies was already presumed. OKC Service was linked to Bitkwadraat, whereas Quarta-Rad was linked to C-it and Steray. The companies Eskiz-MEPhI, MEPhI Ineco and Lidasa were linked to RWB Waterservices. From the latter interview, it appeared that Lidasa was not interesting from technical point of view, and the applications of MEPhI Ineco do not have any added value in the Dutch market.

The interviews with firms in Twente were only conducted by me. From the results, the capitals of the Technopark and UT firms could be compared, laying bare possibilities for synergetic activity and gaps in potential collaborations. The majority of questions from the protocol for the Russian interviews were repeated for the interviews in Twente, be it that the order of questions might differ. The interview and scheme can be found in appendix 4. However, the same indicators were used, which are summarized in figure 3.1.

From the previously conducted interviews at Technopark, it became apparent in what dimensions they need help. In a similar vein as the perception of Technopark firms about Dutch firms, the Dutch firms must be given the opportunity to respond to the offer made by the Technopark firm. A potential link could already be made. The interviewees were confronted with the Technopark company in question and were asked about their thoughts of collaboration with such a firm in terms of fulfilling the desired function, expectations, alignment of goals, willingness to invest, openness to type of contact and possibilities to fill the gaps. The specific questions can be found in appendix 4.

3.2.3 Sub question 5: 'To what extent does the entrepreneurial support structure of MEPhI add to the business characteristics of Technopark firms for international collaboration?'

To answer this question, desk research was done on what support instruments were present within the MEPhI entrepreneurial support structure and the director of Technopark was approached to introduce the system. Furthermore, the firms were asked what help they received from MEPhI or Techopark during the interviews with the directors. The interviewees were asked what kind of support they receive, how MEPhI or Technopark helps them to become more internationalized, what the support structure does that the firms cannot do themselves and whether or not they are satisfied with this support. The specific questions can be found in appendix 3. These techniques were very suitable to create a first image on what instruments are available. For more detailed information on what support is offered by these instruments and how this support aids the business characteristics of the firms, in-depth interviews were held with experts on these support instruments. The information needed was not available in written form, making a face-to-face meeting necessary. The interviews contained specific questions on whether or not they performed the activities mentioned in model 2.5, but also contained open questions to find how the system enhanced the capitals. Once all information was gathered, the results from all instruments could be combined to see if all necessary factors of the adapted 4S model were present in some way. Through this, it also became apparent what aspects were still missing. Combining the instruments is a better way of judging the entire support structure than simply researching the instruments individually, as the instruments

have synergetic effects on each other and it is impossible for one instrument to contain all aspects in full.

Appendix 5 shows the instrument used to research the support structure of MEPhI and a scheme on what questions are connected to which activity or dimension. Not all questions were necessary for all departments, for instance when it was already clear that this department did not engage in mentorship. For this reason, variants on this interview were used for each department.

The interview included specific questions on the activities suggested by Broekstra et al. (2002) and their necessary or preferred aspects as were elaborated upon in appendix 6. It was asked whether or not mentorship was provided, if training and counseling was offered, if there was any support in obtaining intellectual property, if monitoring activities were carried out, how the department helped to enhance networks of the firms, and if any facilities or access to financial resources were taken care of.

It is not sufficient to ask what activities are performed. What we actually want to know is *what* is supported. It was pointed out in chapter 2 that the support instruments need to support the four dimensions. For this reason, specific questions on how the department supported these dimensions were asked. It must be noted that the answers would probably indicate the activities that were mentioned in the first place. For instance: '*How do you enhance marketing skills of the firms?' 'We provide training and have mentors that guide them'.*

The interviews use the same operationalizations and indicators of capitals as in the interviews to investigate the capital situations of the firms, which are depicted in figure 3.1. The only difference is that the indicators are not used to identify possession and lack of capital, but in what way the support instrument aids in these indicators and whether or not the support instruments believe that these indicators are sufficiently present at the firms.

In the social network dimension the focus is on positional and relational aspects, degree of internationalization, and perceived importance. The departments were asked in what way they enlarge the networks or improve already existing connections of the firms. Furthermore, the degree of internationalization is reflected through asking how the department supports this, if there is any help to locate foreign customers, partners or suppliers, if the current degree of internationalization is sufficient, and what could be done to improve the situation. The perceived importance was indicated by asking about the relevance and added value of networks.

3.2.4 Sub question 6: 'What recommendations could be given to enhance collaboration between Technopark companies and UT firms with the aim of business development?'

Through the previous questions it becomes apparent what business characteristics are missing at Technopark firms. Some can be complemented by UT firms or the current entrepreneurial support structure. Others can not, which is where additional help is needed. Brainstorming, common sense and knowledge from education are used to give suggestions on how improvements might be realized. Also, some suggestions were given by the Technopark firms themselves, as they were asked during the interviews how MEPhI or Technopark could aid the firms more to attain preset goals, to distinguish themselves more in the market, to improve skills, to obtain necessary resources, and to add value to the current network. The specific questions are indicated in appendix 3.

3.3 Limitations

There are several limitations connected to the methods used.

3.3.1 Single informant bias

The research might suffer from single informant bias, as it was not possible to interview more people per Technopark firm. The directors of the firms were willing to be interviewed, but did not see the need to provide access to employees to be interviewed. The general opinion was that they could not tell more than the director could. Through only speaking with directors, it was not possible to check the reliability of the answers. However, this research is a multiple case study and directors of other companies were interviewed as well. So, at the company level the study suffers from single informant bias, but on a higher aggregation level it was possible to put the answers of the individual directors somewhat into perspective.

3.3.2 Asymmetry

When interviewing the Technopark firms, it was not yet clear to what Dutch firm they would be linked. This influenced the discussion on what the Technopark company could offer or expect from the UT firm, and how desirable cooperation with such a firm would be. On the other hand, a fit could already be made when interviewing the Dutch company. In this way, the UT firm had more explicit data to base an opinion on.

3.3.3 MKTOR scale

Regarding the MKTOR scale of Narver and Slater, it is argued by Langerak (1997) that the scale lacks 'basic specifications of method as well as specific reliability and validity checks'. Furthermore, the opinion of the consumer is nowhere included. Gabel (1995) expresses his worries when he says that the scale is 'published in the discipline's premiere methodological journal and thus likely to be (blindly) employed by future researchers'. From this, it can be doubted if the scale is fully reliable and valid. However, there are currently no better scales available (Langerak and Gabel in Van Raaij, 2001, p. 29-30).

3.3.4 Lumpkin and Dess

The scale of Lumpkin and Dess to measure entrepreneurial orientation has been used very frequently in science and has proven itself. However, the phrasing of the statements is complex and culturally difficult transmittable, leading to possibilities for misinterpretations. This influences the validity of the results.

3.3.5 Translation of concepts

The existing measurements of Narver and Slater and Lumpkin and Dess needed to be translated into Russian. Translated words can have different connotations in different languages, which is difficult to grasp. There are no guarantees that the translated measurements convey the exact intended meaning, leading to validity problems.

3.3.6 Unconscious incapability

The firms might not be aware of certain shortcomings that they might have. This makes it very difficult to see if they need additional help in these specific areas, and can only be overcome by investigating the indicators of these areas. However, to do this, one already needs to have presumptions on what aspects unconscious incapability might be of influence on. It is tried to minimize this problem by using as many indicators as possible for the operationalizations of the four dimensions. In this way, it can be expected that the results are still valid.

Chapter 4: Analysis of current capitals

This chapter provides an overview of the capital situation at Technopark firms, and in what way UT firms can add to these. The following questions were asked:

3. 'To what extent do Technopark firms possess the necessary characteristics for international collaboration?'

4. 'To what extent can characteristics of UT firms add to the characteristics of Technopark companies for international collaboration?'

This chapter begins with a section on remarkable aspects that were generally present or lacking at the Technopark firms, after which a summary is given in which areas help is needed to internationalize. After that, there are sections on possible fits between Technopark companies and Dutch firms.

For the seven companies with international interests, it was tried to find hypothetical partners in the Netherlands. I did not succeed for Teros MEPhI, because too few details on their technologies were exposed to conduct sensible conversations with potential interested parties. Lekis was too broadly oriented, making it very difficult to find a company that was engaged in similar activities. There have been conversations to link Lidasa. However, the Dutch companies are not interested in using solar energy for water purification, and there is not enough sun in the Netherlands. MEPhI Ineco did not have a competitive advantage in the Dutch market, because its household filters are superfluous in a country with very high drinking water quality.

Quarta-Rad, Eskiz MEPhI and OKC Service have been analyzed further and are included in this chapter. Possibilities for collaboration with C-it, Steray, RWB Waterservices and Bitkwadraat have been explored. This provides a picture in what areas the partners could fill the gaps in capitals of Technopark firms, and which gaps cannot be filled.

4.1 Capitals of Technopark participants

Appendix 7 shows a factsheet on all researched Technopark firms. A detailed general analysis can be found in appendix 8.

4.1.1 Scope

The Technopark participants have peculiar ideas about strategy in comparison to the standards used in Europe. The strategies are often very broad and push-oriented, which does not provide much guidance for operations. The firms want to develop new products and grow in the market, mostly. The chosen strategies are surprising when taking into consideration that the overwhelming majority of companies indicated to solve problems of customers rather than to sell products or services. These strategies are even more surprising because the firms have high market orientations according to Narver and Slater. The firms had an average score of 5,8 on a scale from 1-7. This implies that they understand the importance of the customer and competitors, that should be reflected in their strategy formulation. However, their strategies do not at all reflect the importance of customers and competitors,and the most important thing is to create a product and put it on the market. Examples are LEKIS and MEPhI Ineco, who aim to 'realize liabilities of clients, push ideas towards mass production, and make a profit from these ideas', and to 'develop new products and enter other Russian regions', respectively. From observations as these, the results of the MRKTOR scale on customers and competitors seem contradictory to the actual strategies. This is illustrated further by the fact that some firms even stated that they do not have any competitors, because their technologies are unique. Lekis and Teros MEPhI, for example, argued that 'there are no competitors'

because their firms are 'radically innovative'. This is disturbing because it indicates short-sightedness. Even if their technologies are the best and cheapest in the world, this does not mean that the customers also know this. There are always other firms that offer solutions to the same problems, be it with similar products or services, or totally different products and services. And even when this is not the case, there will always be others that look for possibilities to start offering them in the future. Even when there are currently no competitors, the firms cannot afford to neglect the phenomenon. In addition to this, most firms were not able to specify their exact market segment, or why this market segment is so interested in their products. Quarta-Rad has not researched the needs of its customers or why they are buying the product, but they 'believe it has to do with growing concern of people for their health'. The concept of market segment was not widely understood by the firms, as some of them indicated their field of activities and their output rather than what people, companies, or industries they target. Examples are Teros MEPhI, who indicated that the "market segment is water purification", Lekis arguing that "science and technology are market segments", and MEPhI Ineco, who stated that their "market segment is everyday usage of filters and filters for industrial applications".

It seems that the firms have not given much thought about their strategies, but operate in a more ad hoc fashion. It even became apparent that some firms do not understand the notion of strategy. It was asked if they were willing to adapt their strategies when this would be beneficial to others, and one firm meant they were willing to adapt their offers to the customer. This lack of strategic understanding can harm the firm and is not facilitating in relationships with others. A clear and thought-through strategy is needed to know what partners can expect from each other, and how things will be done in the relationship. Operations will be more efficient when there is a clear strategy, and if there is more research on customer needs what firms will act upon, firm performance is likely to increase. The participants of Technopark clearly need help in formulating their strategies. But first, they need to become aware that they need to improve.

Not all technopark participants have international goals. This is not a problem, as this is a matter of choice and market possibilities. It is not necessarily better to internationalize. Seven of the ten companies have goals in the international market, and four of them already have experience in this area. Production and processes comply to international standards, but the firms face difficulties in applying for international patents because of expenses. This could pose problems, as the firms cannot protect their unique technologies in foreign markets, whereas these technologies are one of the main aspects of competitive advantage, together with quality and price.

Although there are firms with international goals, it is very difficult for foreign companies to know about them. If the firms were to publish more in English, it would be easier for foreign companies to know about the accomplishments, and the reputation of the firms would be enhanced. Of course, this is also relevant in the internal market, as other scientists or firms could learn about developments and become interested in products, and the firm would become more known and respected. It could be that this lack of publishing is connected to the fear that others 'steal' the new technologies.

There is strategic capital when firms are able to attain their preset goals. The firms should be able to do that. They are powerful because of their uniqueness and ability to persuade others, rather good reputations and flexibility towards others, making others also more willing to adapt their goals when necessary. Furthermore, the customers do not exercise too much influence over the firms in their generations of revenues. Although they have tools to realize their strategies, the goals set are not very specific, and the attitude towards innovation is not clear for many companies, as they want to innovate, but also value stability very much. Market orientation is high according to Narver and Slater, but this is not reflected in the strategies. It seems that the firms lack strategic understanding, and connected with this, are not able to formulate a solid strategy. Furthermore, there are many

difficulties in applying for international patents, and publishing could be promoted, even more so in foreign languages. Table 4.1 shows a summary of general points of improvement at Technopark firms in the scope dimension. More information on this can be found in appendix 8, pp. 133-141.

General points of improvement: scope
Strategic understanding and formulation
Market orientation
Applying for international patents
Promotion of publishing (in English)

Table 4.1: General points of improvement: scope

4.1.2 Scale

Most firms need more financial resources than they currently have access to, but with exception of Lidasa and Teros MEPhI, they have sufficient facilities. In the future, several companies would like to have more area, though, and Quarta-Rad is at the limits of its possibilities. The general lack of financial resources could pose problems. The companies have to obtain more money somehow for projects, previously mentioned area, to survive, for growth, or for new developments.

The current average return on investments is 38%, average revenues is 425.000 euro and profit was 139.285 euro. On average, each employee generated 22.368 euro annually. With exception of Lidasa, financial performances seem to be in order, and growth is expected at almost all firms.

The operations of the firms are efficient, and most money is spent on primary business processes. Costs could be cut in areas beyond the firms influence, such as rent, bribes and taxation. Especially rent is considered to be very high and several companies requested for a change in rent policy. This would lead to more efficiency in operations that would benefit a partner. Now, rent increases annually and there are no long-term agreements about this matter.

Table 4.2 shows a summary of general points of improvement at Technopark firms in the scale dimension. Details on the scale dimension of Technopark firms can be found in appendix 8, pp. 142-146.

General points of improvement: scale
Access to investors
Area and rent policy

Table 4.2: General points of improvement: scale

4.1.3 Skills & values

The firms are very well technically skilled, which is not really surprising in the overwhelmingly technical environment and where all the directors are graduated in physical engineering. Contrary to these high technical skills, entrepreneurial skills are very low. There are hardly any skills in marketing management, as only six out of a total of 215 people have received education in this field. Often, these are the directors of the firms, whose specializations are technical. None of the firms researched have confidence in their own marketing skills and most understand that improvements are needed. Without marketing skills, it is not possible to get the maximum out of possibilities or to adapt offers to needs and demands from the market. It should be mentioned once more that many firms seem to be ignorant of their competition, as they indicated that they do not even have competitors because of their unique technologies. Better education in marketing could overcome these problems and increase firm performance. Financial management skills are also low, but higher than marketing management skills. Half of the companies have educated people in this field, either the bookkeeper or again, the director. The firms are slightly confident about their skills in finances. In addition to this, education in entrepreneurship is not overly present, and only one director has other

companies. This means that the firms do not have anything to back up skills in business administration and organization, and need to learn all by doing and have to do things intuitively. Years of study have proven that entrepreneurship does not automatically reside in people and that not all skills can be picked up 'on the way'. It is better to back up experience with education. It can be repeated that entrepreneurial skills are low at the Technopark participants, not in the least because the skills that *are* present often reside in one single individual, namely the director.

Connected to the previous, skills in international management could also be improved. There is hardly any education in this field and the firms do not consider themselves to be adequately skilled to function on the international market. Connected with this is the lack of English language skills. Although the Technopark firms make use of translators, direct communication would be much easier and builds more trust between companies from different countries. Also, many websites are solely in Russian, limiting direct access to the world. Nevertheless, almost every firm has international experience in one way or another, although this is often initiated by the other party. It must be noted that firms that do not want to operate on international markets do not really need international management skills.

The firms of Technopark are not really entrepreneurial either, as they score 3,5 on a scale from 1-5 that was developed by Lumpkin and Dess. The firms are not very innovative, are slightly willing to take risks, but are very anticipative of future changes in the market. They do not actively challenge competitors. The last finding relates to frequent statements made by directors who believed that they do not have any competitors, because of their unique technologies. This opinion could severely influence the results on the competitive aggressiveness dimension.

Table 4.3 shows a summary of general points of improvement at Technopark firms at the skills dimension. More information on the skills & values of Technopark firms is summarized in appendix 8, pp. 147-153.

General points of improvement: skills & values
Marketing skills
Financial management skills
Business administration & organization
International management skills (incl. foreign language and websites)

Table 4.3: General points of improvement: skills & values

4.1.4 Social Network

It was very difficult to obtain much information about the entire networks of the companies, but from the information available it could be said that the networks are rather small. The customers are mostly other businesses, although some firms also have individual customers. Not all firms have partners or suppliers, and most even state that there is no competition. All have contacts with MEPhI and Technopark since establishment. All firms benefit from the image of these. The relations seem to be rather similar to each other, causing companies to receive the same information from many contacts, implying that they receive redundant information. Despite the fact that the networks are small, the firms consider them to be very valuable and the firms in turn are also valuable to their network partners. The companies are willing to cooperate, as long as they do not have to give up too much power.

With some exceptions, the companies do not have regular contacts with their partners, as these only occur when needed. The contacts are not very frequent, in general. Furthermore, there are stable relations with customers, but other relations seem not very stable. There are exceptions at two firms, who have had relations with their partners for many years. On the other hand, there is also a firm that states that the network changes every month and that stable networks are for bigger

companies. The networks are not very strong, as contacts are not very frequent and contacts are not stable. Weak ties are beneficial for opportunity recognition, but strong ties are better in circumstances of insecurity.

It could be noted that the companies do not make use of their networks to the extent that could be possible through closer ties and more diverse relations in order to obtain necessary resources. Because the firms are afraid to loose sovereignty, they try to operate in isolation as much as possible. Some firms believe they do not need suppliers, partners are only contacted when needed and nothing is done to establish really close relations. The firms hardly outsource anything. It seems that the companies do not understand the added value that good networks could bring to a company. Connected to this is the small degree of internationalization in the networks. The firms should become more aware of the benefits of a larger and more diversified, and international network for commercialization. Then, steps can be undertaken for enlargement.

Table 4.4 shows a summary of general points of improvement at Technopark firms at the social network dimension. More details in the social networks of Technopark firms can be found in appendix 8, pp. 154-158.

General points of improvement: social network
Understanding the importance of networks
Relationship maintenance

Table 4.4: General points of improvement: social network

4.5 Conclusion

The most important barrier for internationalization of Technopark firms is that they seem to lack a clear strategic understanding. Dutch partners could sometimes help to identify local market segments or how to approach them, but they have also indicated that a solid long-term strategy is an absolute prerequisite to have good foundations for collaboration. Connected with strategic understanding, the firms need to have a clear competitive advantage in the Dutch market that supersedes the difficulty of working with a Russian firm instead of with a Dutch firm. This is not the case for the companies that are engaged in water purification, or for OKC Service. The main reason that there are possibilities for collaboration for Quarta-Rad with C-it or Steray is its competitive advantage of cheap devices to measure radioactivity that are easy to understand. The firms need to develop a clear and solid strategy in which much thought is given to the competitive advantage, in which needs of customers are taken into account and competition is outperformed. This leads to the next point of market orientation. It appears to be possible that the firms score highly on the MRKTOR scale of Narver and Slater, and still have push-oriented strategies to produce items and sell them on the market. Thus, the strategies do not take customers and competitors into account to the extent that they should do. The scale does not seem valid and more research needs to be done. Also, many firms believe that they do not have competitors because of their unique technologies, which influences the results of the MRKTOR scale. The suitability of this scale for highly innovative companies should be reconsidered.

Another barrier to internationalization is low entrepreneurial skills. Almost all firms lack marketing management skills. This is hardly surprising, as the strategies do not include customers either, and the firms push technologies to the market. It seems that the Dutch firms face similar difficulties, which does not make them suitable to take over or enhance marketing skills at the Technopark firms. Although Technopark firms believe they are adequately skilled in financial management, there is little educational background. This could be enhanced. Again, the Dutch partners could do little because the Russian firms are unlikely to open their documents to a foreign partner and the Dutch firms do not know about the Russian guidelines. Also, money was regularly mentioned as a resource that both parties were not eager to share. There are clear synergetic effects with respect to business

administration & organization, as the Technopark firms have experience, and the young Dutch firms have the educational backgrounds. A big problem however, is lack in international management skills, especially foreign language skills. To facilitate communication, Technopark firms need to improve their positions. It has to be pointed out that the skills that are present at Technopark often reside in one single individual. It is not realistic that the director carries out all tasks with respect to marketing management, financial management, business organization & administration, and international management skills, especially when taking into consideration that the directors are engineer physicians.

The Technopark companies do not make use of their networks as efficiently as they could do, and do not fully understand the importance of networks. Collaboration with Dutch partners could provide them access to various resource-full ties, which is different in every partnership. Dutch firms could show them how beneficial networks could be and to overcome the anxiety of sharing with other companies. This is in line with relationship maintenance. The Dutch partner can show that relations need to be maintained and cannot fully function in an ad hoc basis. However, the MEPhI entrepreneurial support structure could also add to the understanding of the importance of networks.

Some other aspects were expected to limit internationalization. One of them is applying for international patents. This was not perceived as a problem by the Dutch companies, who stated that Intellectual Property is often overrated. In fact, the Dutch companies do not all have patents themselves. It would be wise, however, to publish in English to enlarge chances of recognition. The partner could make joint publications, to enlarge reputation. The partners cannot help, however, in the area and rent policy that limits efficiency. This is the responsibility of MEPhI. Last, the Technopark needed additional access to investors, for growth purposes mostly. Some partners could provide this, but this is not the case for all of them.

The first question of this chapter was to what extent Technopark firms possess the necessary characteristics for international collaboration. It seems that they are adequately technically skilled and their scales are in order, but definitely fall short in the strategic and cultural dimensions, especially regarding strategic understanding and entrepreneurial skills. Furthermore, they do not understand the importance of international networks. The second question was to what extent characteristics of UT firms can add to the characteristics of Technopark companies for international collaboration. There are certain fields in which the partner can overcome barriers to internationalization. This concerns business administration & organization skills, market positioning, and network contacts. Furthermore, Dutch firms do not perceive lack of international patents as a problem. Every partnership is different and provides different benefits. Some could improve the market orientations of the firms, or increase international management, where others could not. The firms need to develop themselves in important areas to facilitate chances of success of Technopark firms in international partnerships with diverse partners. Figure 4.16 shows a summary.

It must be pointed out that Technopark companies would like to cooperate with Dutch firms if possibilities occur. They are mostly looking for resellers who are of bigger size than themselves. The Dutch firms are not willing to act as plain resellers, but want to integrate the products of Technopark in their own products, and thus act as indirect resellers. They perceive low prices as a good reason to collaborate with a Russian company, but they have to have clear competitive advantages in the Dutch market, and have clear strategies. It is not a problem that the Russian firms lack international patents, as the possession of patents is perceived to be overrated. In sum, the Technopark firms should be more open to other types of collaboration than reselling, need to improve and develop their strategies and need to think about their competitive advantages.

Dimension	Needed improvements to internationalize
Scope	Strategic understanding
	Market orientation
	International orientation (inc. publish in English)
Scale	Access to investors
	Area and rent policy
Skills	Marketing skills
	Financial management skills
	International management skills (incl. foreign language skills)
Social Network	Understanding importance of networks
	Relationship maintenance

Figure 4.16: Needed improvements to internationalize

The next chapter will explore the MEPhI entrepreneurial support structure to see if it is active in developing the current shortcomings of the Technopark firms.

Chapter 5: Entrepreneurial support structure

Chapter 4 made clear that the Technopark firms need to improve in all dimensions to have better chances to internationalize successfully and that potential UT partners cannot help in all aspects. This chapter explores the possibilities of the MEPhI entrepreneurial support structure to help Technopark to develop their characteristics. The following question was asked:

5. 'To what extent does the entrepreneurial support structure of MEPhI add to the business characteristics of Technopark firms for international collaboration?'

The model that was introduced in section 2.7 can be adapted to include only the remaining needs of the firms, that need to be supported by the activities as suggested by Broekstra et al. (2002). Figure 5.1 shows the adapted model.

In this chapter, the support instruments from the MEPhI entrepreneurial support structure will be introduced. After this, there will be sections to explain how these instruments use the necessary activities to fill the gaps of Technopark firms, and what gaps still remain. Appendix 11 provides brief information on the UT entrepreneurial support structure as an illustration.

Activities support structure linked to 4S and needs

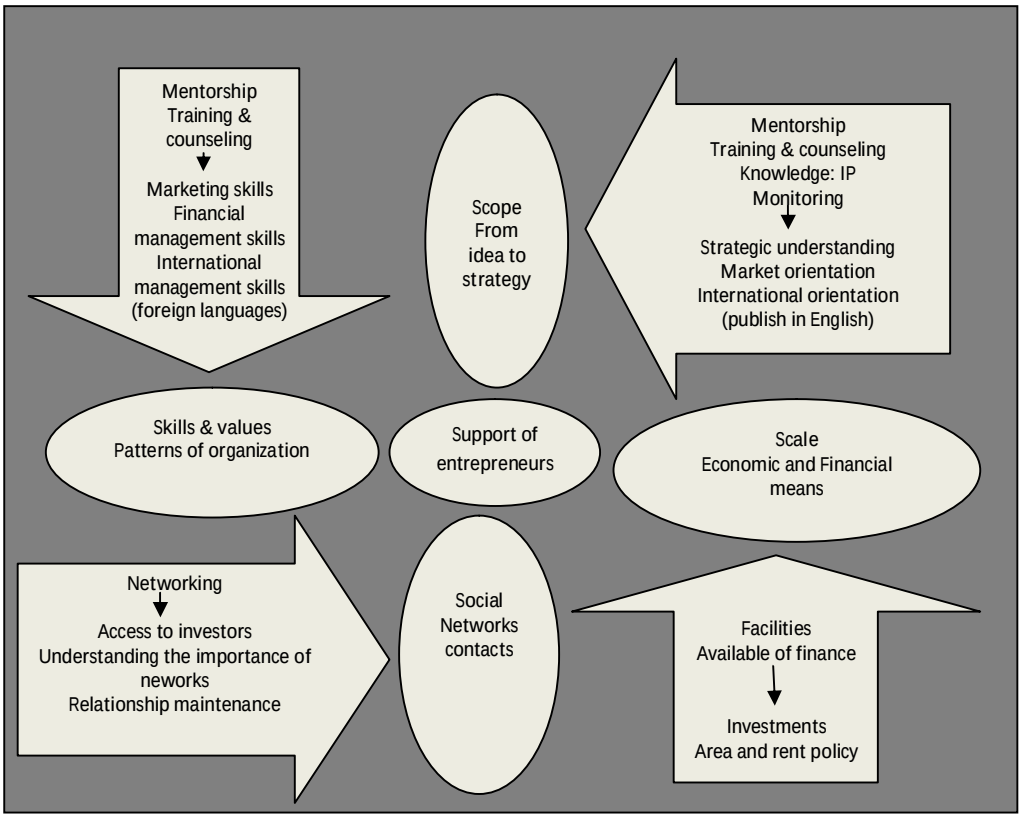

Figure 5.1: Activities support structure linked to 4S and needs

5.1 Support instruments

The main instrument to support spin-offs from MEPhI is Technopark, which constitutes of various centers. Technopark employs 6 FTEs, where employees are responsible for multiple departments. The lines between the centers are blurred. There are the business center, the educational-consulting center, the student incubator of high technologies, the innovation and technology center and a test

laboratory 'Clean water'. The innovation and technology center is merely a juridical term, and the test laboratory is a facility rather than a support instrument. These are excluded from the analysis. The center of student initiatives precedes the student incubator of high technologies. Also, technopark is one of the initiators of the Russian Technology Transfer Network (RTTN). These two bodies are not included in Technopark itself, but can be considered part of the entrepreneurial support structure of MEPhI. The same counts for the faculties of MEPhI that provide input for the firms.

The organizational structure and the relations with RTTN, the center of student initiatives and the faculties is depicted in figure 5.2. More details on the centers and their own capital situations are provided in appendix 10.

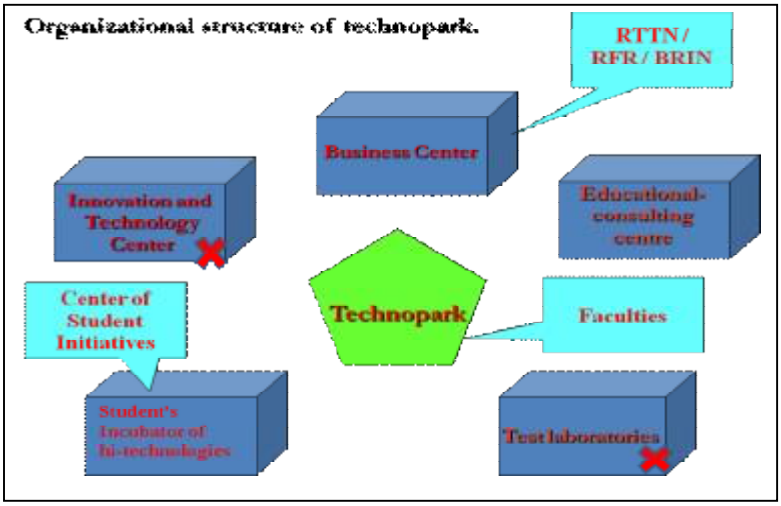

Figure 5.2: Organizational structure of Technopark

5.1.1 Business Center

The business center was one of the first structures of Technopark and offers three levels of services on a commercial basis. Firstly, it offers office and informational services that include basic services such as printing. Then, organizational-technological services for conferences comprise the provision of facilities such as a negotiation room with audio-visual equipment. Last, the business center offers consulting services.

5.1.2 Educational-consulting center

The educational consulting center was established in 2004 from a project between Technopark and the International Science and Technology Center (ISTC) and offers ten courses and consultation in diverse areas to the firms of Technopark and employees on request of ISTC. The aim was to provide training on the basics of commercialization to scientists that work on projects of ISTC, to give seminars to increase the innovative culture of students, scientists and teachers of MEPhI and to provide consulting services in the fields of export control and innovative business. The added value of the center is enhancing qualifications, and education. The courses are not given by the staff of theeducational consulting center themselves. Rather, the center acts as a mediator to administer everything, and the courses are given by specialists.

5.1.3 Student Incubator of high technologies

The student incubator of high technologies was established in 2001 to support starting businesses and to increase entrepreneurial initiatives of youth involving young educated, aspirants, and students of MEPhI in innovative activities in all phases of the innovation cycle that are present at Technopark. The incubator has to provide for practical preparation of young management teams of

the innovation project in the regime of 'incubation' of small scientific firms, and scientific methodology, organizational and financial support to students that strive to realize their ideas and projects in the scientific-technological sphere. There is an annual cycle of activities. The cycle starts with a project search and selection through the international telecommunication Internet conference 'Youth and science'. This has been taking place for ten years. Then, competitions of young innovative projects are conducted in the framework of 'scientific sessions of MEPhI'. Groups that won competitions based on scientific business and management of innovative projects during the semester are organized and educated. Management teams are formed for innovative projects, and business plans are presented, exploited and protected. Also, there are internships at the firms of Technopark, teams are allocated and there is office representation for starting firms. Last, the center offers consultation with help of the educational consulting center.

5.1.4 Center of Student Initiatives

The center of student initiatives carried out incubator activities before establishment of the student incubator of high technologies in 2001. Currently, the center is purely scientific, but is still somewhat connected to the incubator. Students with best results from the center can enter the student incubator. The center belongs to the MEPhI structure, and not to Technopark.

5.1.5 Russian Technology Transfer Network (RTTN)

Technopark is one of the initiators of RTTN, which was established in 2001. RTTN is a website where individual companies, scientists, scientific teams, big companies, or investors can make offers or requests to find a partner or an investor in areas such as industrial technologies, informational technology, ecology, medicine, biotechnology and new materials. It could be said that the network is involved in transfer of technology between scientific sectors and the industry, partner search for technological cooperation in development, and the introduction of scientific ideas from Russia to world commerce. The goals are growth and enhancement of the competitive advantage of Russian high-technology business, and involvement of scientific-technological potential of Russia in world commerce. The network is still very small and is not used very often. Not all Techopark firms know about the existence of RTTN. What is even more interesting, not even all departments of Technopark know about the existence of RTTN. This is very remarkable, because Technopark is one of the initiators, few people work at Technopark and the lines between the departments are blurred.

5.1.6 Faculties

There are 40 specialized faculties at MEPhI, but only 25 companies at Technopark. MEPhI does not have a system to direct the activities of the faculties towards innovation or commercialization, making the connections between the faculties and Technopark very loose. The firms obtain new technologies from these faculties. All faculties are involved in traditional scientific research, and some of them are engaged in commercialization of results. There are no rules that commercialization needs to go through Technopark. There are no track records of results that are commercialized in another way.

5.2 Activities to enhance the scope of Technopark firms

By now, the most important support instruments have been introduced. These instruments should be used to fill the gaps for internationalization of the companies as were mentioned in chapter four. Broekstra et al. (2002) specified certain activities that need to be present in a good entrepreneurial support structure, depicted in figure 5.1. The next step is to see if the instruments use these activities to fill the gaps, that are also depicted in figure 5.1. More details can be found in appendix 10.

In the scope dimension, strategic orientation, market orientation, and international orientation could be improved at Technopark firms. This can be done through mentorship, training and counseling, Intellectual property and monitoring.

5.2.1 Mentorship

Mentorship is offered by the student incubator of high technologies, who links mentors to entrepreneurs. The mentors are specialists from Technopark, the companies of Technopark, or MEPhI staff, and offer expertise in business and technology. They have experience, explain things, help the starting entrepreneurs and give presentations.

Mentorship is focused mostly on starting entrepreneurs, and not on the established companies at Technopark that were subject to this research. In fact, the leaders of these companies could be asked to function as a mentor for others themselves. In this way, mentorship is not used as an instrument to improve strategic, marketing or international orientations. On the contrary, it is a vicious circle. Mentors who lack these orientations themselves, cannot convey these to the starting entrepreneurs. This is also true for MEPhI staff who act as mentors, because they are mainly technologically educated. Also, if the firms are not aware of their lack of orientation in these areas, they will not ask advice. It is to be expected that the future entrepreneurs will also lack these understandings, when not given appropriate mentors.

5.2.2 Training and counseling

The educational consulting center, the business center and the incubator all offer training and counseling. They speak about the same support from the same specialists. There are several courses including ones on international business and specific subjects related to the business plan. Next to this, Technopark offers advice through its specialists in the same areas. The educational consulting center offers various courses to make sure that the scientists and the investors speak the same language, and has courses on business relations. This includes how a business plan works, what a business offer is, how to protect intellectual property, all about business registration, project management and looking for investments. The center does not help to establish goals, as this is seen as the responsibility of the firm itself. It only helps to draw up the plan. The incubator and business center do help to establish short and long term goals through consultation. Lastly, the educational consulting center offers consultations on the latest information about changes that are taking place in the market. Top managers of big companies who know the market can give concrete advice and Technopark helps to identify the market segment.

The tools are present to enhance strategic, market and international orientation through the courses on business plan creation and through consultation, although publishing in foreign languages is not promoted. Nevertheless, the courses or consultations are not compulsory. If the firm does not ask for advice, it will not receive it. One of the problems is that the firms are not aware of their lack of strategic understanding, market and international orientations. They might believe they do not need these courses or advice. The firms need to be made aware, after which they can use the tools for strategic improvements. Furthermore, the firms are not really aware of the training possibilities offered to them by Technopark.

5.2.3 Knowledge: Intellectual Property

Technopark helps firms to apply for patents, to obtain licenses and certificates, and also helps to apply for international patents and advices on international certifications. Nevertheless, Technopark does not have much experience in this area, as this occurs rarely. Also, the Russian codex on protection of intellectual property will be renewed at the end of 2007. This will cause many changes that are not all known to Techopark yet.

This activity does not help to enhance the strategic understanding of the Technopark firms.

5.2.4 Monitoring

None of the departments at Technopark consider monitoring to be their field of activities. The leaders of Technopark and the firms gather once or twice every semester to discuss occurring

business and important matters. Real company evaluations with implications do not take place, which would guide business development in aspects that could not have been foreseen while creating the business plan. One could regard it more as regular meetings to keep oneself updated on what is going on at Technopark, rather than setting goals which need to be met. For this reason, monitoring activities do not enhance strategic understanding or market and international orientation.

5.3 Activities to enhance the scale of Technopark firms

In the scale dimension, the firms need more financial resources and the efficiency of the firms could increase when the area and rent policy of MEPhI were to be adapted. This section explains to what extent facilities and the availability of finance fulfill the existing needs.

5.3.1 Facilities

The business center offers facilities on three levels, namely basic services, organizational-technological services for conferences, and consulting. It is also possible to make use of the directorate of Technopark and accountancy services. These facilities are offered on a commercial basis and are used by established firms and by start-ups. There are special price arrangements for participants of the incubator. The first six months, facilities are free. The next six months they have to pay 25-50% of the actual costs. After one year, they pay 70%, and after 1,5 years, the full price needs to be paid. Next to this, the incubator offers an area of 30 m^2 with 6 computerized work places that includes Internet, telephone connections, electronic schemes, and radio equipment. This offers place to six starting companies, at maximum. Services and facilities are shared, because they can be rented and used by all firms, including kitchen and rooms. Next to this, the firms are located on the premises of Technopark, which comprises 2000 m^2 where 350 employees are working. These have the right to use services of MEPhI subdivisions such as canteens, shops, medical services, gyms, dormitories, sanatoria, etc., as well as general protection and guards of the territory. The work places that are offered to six start-ups are not shared. Only when a company grows and enters Technopark the space will be free for a new start-up to enter.

The firms improve efficiency through facility sharing. They do not have to purchase all equipment and spaces themselves. However, price agreements and facility sharing does not provide more investments, which are still needed. Also, the price agreements are only for start-ups, as it is not healthy to give discounts to established firms. Neither does it solve the problem in area and rent policy. The firms need to pay $300 per square meter annually. Every year, new price agreements are made that always increase.

5.3.2 Access of finance

The firms included financial forecasts in their business plans to assess the needs for finances. Also, Technopark stays informed about the financial performance of the firms as it has access to commercial and financial information that is closed to others. It seems that there are few investors and many companies that need investments. Technopark tries to find different Russian funds to give money, and tries to locate investors. Examples are the Moscow Fund and the Fund on support of small enterprises. The incubator in particular helps to find start-up financing through funds of the Moscow government and regional and federal programs for youth. The fund for growth of small companies accredited five projects which received RUR 200.000. The business center also provides assistance in searching investors through monitoring the Internet on websites of the ministry of science and education, fund for the growth of small companies and other organizations that provide financial support. There are also contacts with bigger companies that work in other areas but want to invest in the small firms. RTTN helps to find investors through an Internet portal, but again, there are few investors and many companies that seek them. Approximately 10% of the investors are foreign, such as from Canada, France, the UK, Germany and India, and from companies such as LTD. It must

be understood that there are many difficulties in finding foreign investors, as the Russian market is not stable enough and foreign investors are very careful.
The activities to enhance availability of finance does not concern the area and rent policy. However, investors are found to overcome needs in financial resources. It must be noted that investments are mostly sought in funds. This is because there are not enough investors to be found for the many companies that need investments, and because foreigners are cautious to invest because of the unstable Russian situation. Investments from funds are not optimal, because they are often once occurring. It would be better to have good relations with an investor who could provide stable investments.

It must be understood that Technopark is non-commercial, but it is not part of the state either. Technopark earns its money through services and ordered scientific works, and grants. MEPhI receives money for every student, which is more than it receives from the companies. Students are therefore more important to MEPhI than the firms, leading to little financial help.

5.4 Activities to enhance the skills of Technopark firms

The companies at Technopark could improve their skills in marketing, financial and international management to be better prepared to internationalize. Mentorship and training and counseling could enhance these skills.

5.4.1 Mentorship

As was said in section 5.2.1, mentorship is offered by the student incubator of high technologies. The mentors are specialists from Technopark, the companies of Technopark, or MEPhI staff, and offer expertise in business and technology. The mentor gives advice and recommendations, and the entrepreneur can come to the mentor with occurring problems.

In theory, the mentors can enhance marketing, financial and international management skills. Nevertheless, the same restrictions as in the scope dimension can be witnessed here. The established firms act as tutor, who lack these skills themselves and are not able to enhance these skills for start-ups. MEPhI staff is technologically oriented. There is hope, however, for marketing skills. The firms are aware that they need to improve in this field, so they could ask advice from business specialists outside MEPhI. However, this only holds for start-ups, because the established firms do not make use of mentors anymore.

5.4.2 Training and counseling

Section 5.2.2 pointed out that the educational consulting center, the business center and the incubator offer training and counseling. There are courses on marketing, financial management and international business, and advice is given in the same areas. Technopark staff and external consultants also offer consultation on concrete projects and assignments.
It seems that the necessary areas in the skills dimension are covered, be it that international management skills are covered only to a very small extent and no foreign language support is provided. Many directors and staff graduated when international markets were not important. Currently, MEPhI offers more courses in this area, which is hopeful for future spin-offs. Nevertheless, there are still firms that need more skills in international management and in foreign languages now. Furthermore, it is very interesting to see that the departments of Technopark believe that the firms are adequately skilled in marketing management, which is contrary to my findings. This difference in observation leads to inadequate support of the firms. Furthermore, the departments are not very convinced about their own financial management skills, leaving us with questions on how they can provide adequate support. External consultants are used for these purposes. Last, Technopark is not fully aware of the lack of skills in international management at the firms.

5.5 Activities to enhance the social networks of the Technopark firms

In the social network dimension, the firms need to gain more access to investors, and they need to gain understanding of what benefits good networks can bring. Next to this, they need to improve their relationship maintenance to get the maximum out of resourceful ties.

5.5.1 Networking

Technopark occasionally organizes meetings with all entrepreneurs connected with the park. In this way, they can network with each other. The same counts for participation in exhibitions and conferences, which is strongly promoted and also organized by Technopark. An example is the Internet conference 'youth and science' and the exhibition 'scientific sessions of MEPhI' that are organized by the incubator and MEPhI. There are also PR activities, such as press releases and Internet publications and an annual forum of young entrepreneurs through which contacts can be established. However, RTTN is the most important instrument to establish relations with other firms for investments or partnerships, although it is not used very much. It is a passive rather than an active network where there are only a few unknown mediators. If the company has a specific company in mind for cooperation, he has to arrange it by itself. These partnerships focus on technical aspects, the partner or investor also needs to be a RTTN member, and there is no guidance after establishment of the contact.

International contacts could be established through RTTN, exhibitions, seminars and conferences as well. At RTTN, people can place their offers or requests in a general database that is also accessible to the International Relay Center and French RFR and British BRIN. Nevertheless, RTTN has only established one international contact in its life-time. Furthermore, Technopark does not organize international conferences, only when there are foreign delegations, but promotes participation in them when there is enough money. The business center tries to support establishing international contacts as much as possible, but there are not many possibilities. The educational consulting center is willing to help when firms want international partners, but they do not really look for it. There is general agreement that it would be interesting if there were more international contacts and activities and that the firms at Technopark are currently not sufficiently internationalized. Technopark offers too little support in this area, as more people could be invited for partnerships. This is only a recent direction of activities of Technopark.

The networking activities are helpful in finding investors, be it to a small extent. RTTN is the most important instrument for this, but again, it is not used widely. Technopark itself is more involved in obtaining grants than finding real investors. However, the support offered does not enhance the understanding of importance of networks, nor does it help to maintain relationships. On the contrary; once a relationship is established, the firms are on their own. The only thing that is done is that Technopark makes minor efforts to link one party to another, but Technopark is not actively looking for international partners. The kinds of partners that are found through Technopark are very similar to each other, as they are mainly technical. Chances of redundant information are high.

5.6 Conclusion

This chapter introduced the main instruments of the MEPhI entrepreneurial support structure, namely the business center, the educational-consulting center, the student incubator of high technologies, the center of student initiatives, the Russian Technology Transfer Network and the MEPhI faculties. These instruments use various activities to enhance the business characteristics of Technopark firms.

In the scope dimension, the firms need to improve their strategic understanding, and market and international orientations. Training and counseling provide support on international business and specific subjects related to the business plan, but the courses and consultations are not compulsory. This means that the firm needs to be aware of its shortcomings before making use of the existing

instruments. The firms are not aware of their needs in the scope dimension, so the gap is not yet filled. Furthermore, publishing in foreign languages is not promoted at all. In addition to this, Technopark provides mentors for starting entrepreneurs. In theory, they could help start-ups to improve their strategic understanding, and market and international orientations through thorough guidance. However, the mentors are mostly directors of existing Technopark firms or MEPhI staff, who also lack these understandings. Intellectual Property support and monitoring do not help to fulfill the needs either.

In the scale dimension, the firms need more financial resources and improvements in area and rent policy to increase efficiency. The business center offers facilities and facility sharing on a commercial basis in order to increase efficiency and limiting the need for capital. Start-ups benefit from special price arrangements. However, these facilities do not solve the problem in rent and area, and the firms still need additional investments. Technopark tries to facilitate in finding investors through funds, mostly. These are one-time investments, where stable investments would be preferred. Stable investments would also require the firms to give up some power to the investors, who might be able to share other valuable resources as contacts and knowledge. RTTN is the most promising instrument to help find investors through its Internet portal, but there are few investors and many companies that seek them. Furthermore, RTTN is not widely known or used.

In the skills dimension, the firms need to enhance skills in marketing, financial and international management. The mentors are unlikely to develop these skills at start-ups, because they lack these skills themselves. Nevertheless, there are courses in these fields, and consultations are given by specialists. As in the scope dimension, the firms need to ask advice before they receive it and the courses are not compulsory. The companies know that they need to improve their marketing skills, so they can make use of the available tools. However, Technopark believes that the firms are adequately skilled in marketing management, leaving room to doubt if they provide the right support. Technopark does not seem fully aware of the shortcomings in international management skills either. Because of this unawareness, it is not possible that they offer the exact support that is needed. The firms are less likely to request support in financial management and international business, because they are less aware of these shortcomings. Furthermore, Technopark is not in the right position to offer financial management advice because of their own inadequacy, so external consultants need to be used. Lastly, international management skills are only covered to a very small extent and no attention is paid to foreign language skills.

In the social network dimension, the companies need to gain more access to investors, need to improve their understandings of the benefits of good networks, and need to learn relationship maintenance to receive the maximum from resourceful ties. The networking activities offered through RTTN, exhibitions and conferences, PR activities and an annual forum could help to find investors. RTTN is the most important instrument, but is not used often. The support does not stress the importance of networks, nor does not help to maintain a relationship because the support does not go beyond establishment of one. There is agreement among the departments that Technopark is not actively looking for international partners and that any kind of contact can be useful. It seems that Technopark is more aware of the importance of networks than the firms are. However, they do not seem able to convert this idea upon the firms, as they are still trying to operate in isolation as much as possible because of trust issues. Also, the partners that are found through Technopark are very similar to each other, enhancing redundancy in the networks.

This chapter was looking for an answer to what extent the entrepreneurial support structure of MEPhI adds to the business characteristics of Technopark firms for international collaboration. None of the needs are adequately filled, but there are tools to enhance strategic understanding, market orientation, access to investors, marketing skills, financial management skills, and international management skills. There are no tools to enhance publishing in English, there are no signs of

improvement in area and rent policy, no attention is paid to foreign language skills, and there are no tools to increase the understanding of the importance of networks or to teach firms to maintain relationships. Figure 5.3 summarizes the remaining gaps. The next chapter will suggest some developments in the MEPhI entrepreneurial support structure to use and adapt existing instruments to fill the remaining gaps.

Dimension	Needed improvements to internationalize
Scope	Strategic understanding
	Market orientation
	International orientation (incl. publish in English)
Scale	Access to investors
	Area and rent policy
Skills	Marketing skills
	Financial management skills
	International management skills (incl. foreign language skills)
Social Network	Understanding importance of networks
	Relationship maintenance

Figure 5.3: Needed improvements to internationalize

Chapter 6: Recommendations

Chapters 4 and 5 indicated what factors for successful international collaboration of the 4S model are lacking and are not overcome by potential UT partners or the current MEPhI entrepreneurial support structure. Recommendations could be given to overcome these remaining gaps, that were summarized in figure 5.3. The following question was asked:

6. 'What recommendations could be given to enhance collaboration between Technopark companies and UT firms with the aim of business development?'

This chapter provides suggestions to overcome the specific indicated problems, but also makes suggestions on a higher level in which the specific suggestions are embedded.

6.1 Problem – solution

In this section, specific recommendations are given to improve the problems as identified in chapters 4 and 5. The solutions are discussed per dimension, in which there are several specific points of improvement. Sometimes, more points per dimension can be improved by the same actions. In this case, these points of improvement are discussed in a combined fashion. Figure 6.1 provides an overview.

Recommendations

Dimension	Point of improvement	Action by firm	Action by support structure
Scope	Strategic understanding	Establish operative goals, Open towards collaboration other than direct reselling	Appropriate mentors and consultants, Formal monitoring for start-ups, Seminars, campaigns and lobbying for established firms, Strategy in MEPhI curriculum
	Market orientation	Rethink and communicate competitive advantage to market	Appropriate mentors and consultants, Formal monitoring for start-ups, Seminars, campaigns and lobbying for established firms, Market orientations in MEPhI curriculum
	International orientation	Publish in English Active search in foreign markets	Appropriate mentors and consultants, Formal monitoring for start-ups, Seminars, campaigns and lobbying for established firms, International orientation in MEPhI curriculum
Scale	Access to investments	Prepare to give up power to investors, Use RTTN	Develop RTTN further, Increase Technopark network to include investors, PR activities to make Technopark more attractive to investors
	Area & rent	-	Long-term rent agreements
Skills	Marketing, financial and international management	Attract/retrain employees, Divide knowledge throughout firm	Appropriate mentors, consultants and teachers, Promote training and education possibilities, Organize promoted seminars and workshops, Marketing, financial and international management in curriculum
Social network	Understanding importance of networks	Learn to function outside isolation Attract partners with diverse resources	Appropriate mentors and consultants, Organize promoted seminars and workshops, Networks in curriculum
	Relationship maintenance	Flows from understanding	-

Figure 6.1: Recommendations

6.1.1 Scope

Strategic understanding, market orientation and international orientation

In the scope dimension, several actions can be taken that will improve strategic understanding, market orientation and international orientation of the companies. It is the task of the support structure to make them aware of the fact that the firms are not very competent in these areas. Then, the firms themselves can implement adaptations. This section provides recommendations for the support structure, after which attention is given to the individual firm-level in relation to Dutch expectations or requirements.

Creating awareness on strategies and (foreign) markets begins with education. The MEPhI curriculum should contain specific courses on strategy that clearly define the concept, identify characteristics of good strategies, develop skills in strategy formulation and provides sufficient attention to the market and publishing in foreign languages to gain access to foreign countries. These courses should be available and promoted in all faculties, not only in related disciplines. The purpose is to make technical specialists acquainted with the concept. Besides educating students, there are more activities to be done.

Besides education, the second recommendation in the scope dimension is to adapt the mentor and consultation system to include mentors and consultants with appropriate qualifications. In the current support system, start-ups can make use of mentors from established Technopark firms, from MEPhI staff, or from external businesses. It was said that these mentors frequently lack strategic understanding and market orientation themselves, and little attention is paid to international orientation. However, it is not clear if these generalizations can be extended to include the external business mentors. The support structure needs to attract mentors with appropriate strategic understanding and orientations who can detect shortcomings and help the firms improve their strategic competence and orientations so that they can function independently without mentor in the future. Next to mentors, start-ups can also use consultants for their problems. It is the responsibility of the support structure to make sure that these understand the concepts strategy and market very well in order to guide start-ups through the process of strategy formulation and planning, and adjusting strategies to market requirements. When interested in internationalization, they should be qualified to help the firms establish realistic foreign goals. In addition, they should be fully aware of the importance of publishing in foreign languages and having international websites, an opinion that needs to be conveyed onto the firm. Furthermore, they should encourage entrepreneurs with international intentions to actively search in foreign markets instead of waiting for opportunities to arise. As all of the previous is currently not the case, these consultants need to be newly attracted or retrained.

The third recommendation involves a monitoring team. Start-ups are not formally monitored. The support structure needs to create a system in which young companies are monitored and their performance is periodically evaluated, after which goals could be adjusted. This provides starting companies with a tighter framework with more guidance in which to operate.

It must be pointed out that established firms and start-ups make use of different support instruments. Mentors and monitoring are mainly meant for start-ups, as established firms of Technopark are expected to function independently. This means that the previous suggestions on mentors and monitoring would only benefit the next generation of spin-offs. Nevertheless, the current generation faces identical problems. Once the established firms become aware of things that need to be improved, they can take their own measures. When thought fit, they can also make use of the consultants offered by Technopark, as previously mentioned. Also, the support structure could organize seminars and campaigns to create more awareness. They could also approach the firms individually and express their concerns.

The firms can do something themselves as well, in order to improve strategic understanding, market orientation and international orientation. Once the support structure succeeded in creating more strategic awareness, the firms could put more effort in establishing clear and operative goals. Also, once market orientation is understood better, the firms are more able to adapt their offer to the needs of the market, and to outperform competitors. In addition, once the importance of being accessible to the world has been pointed out, they will most likely change their websites and publish more in English. The established firms could also choose to follow several courses that are already provided for in the current structure.

It became apparent that the Technopark firms prefer partners in direct reselling. However, the UT firms were not interested in this, because there would be little benefit for the Dutch companies. The Technopark firms should be more open towards other types of collaboration, that could be very fruitful for both parties. This is connected to strategic understanding.

Next to this, the firms and representatives from Technopark believe that the companies have good competitive advantages. The technologies are new or of very good quality, and prices are low compared to Western Europe. However, the Dutch firms were not very convinced about these competitive advantages. Related to market orientation, the firms need to think about how to position their offer in the (foreign) market, and how to persuade this market of the benefits thereof. After all, an offer might be the best available, but the customer might not know this. Communication is the key.

6.1.2 Scale

Access to investors

The existing support structure makes attempts to attract investments for its spin-offs. However, investments are mainly sought in grants, which are only once occurring. It would be much better to regard these grants as bonuses, and not as main sources of income. The structure should focus on long-term investors who want to commit themselves to the company or project, preferably with the right knowledge and skills in order to inject extra resources into the firm. RTTN is an exquisite tool to link investors and companies to each other. However, RTTN is very small and not used frequently. Technopark should promote the network more extensively, both internally and externally. Also, the network needs some time to grow, as it was only established in 2001. In addition to this, Technopark should increase its own network to include more investors. This could be done by active search and promotion. Technopark should make an effort to publish success stories and achievements in order to create awareness amongst potential investors for the companies of Technopark.

It is understood that it is very difficult to attract investments because there are few investors and many companies in need. The firms need to be open to give up power to investors, who can also inject additional knowledge and skills into the company. This would enlarge chances of finding a good investor.

Area and rent

It was seen that efficiency in operations is hampered by the area and rent policy of MEPhI. Prices increase annually. It could be suggested to make long-term rent agreements with the firms, instead of annual ones. In this way, they know better what to expect and can adapt their forecasts on this.

6.1.3 Skills

Marketing skills, financial management skills and international management skills

The current structure offers courses in marketing, finance and international management, but not sufficiently, as was elaborated upon in chapter 5. Similarly to the scope dimension, Technopark

needs to attract mentors, consultants and teachers who indeed possess good marketing, financial and international management skills. This includes foreign languages. Mentors need to point out the importance of marketing, financial management and international management to start-ups, and need to adjust the practices of the firms when necessary. Established firms can also use the courses and consultants, but they are not widely known. Technopark should execute more promotional activities to make firms more aware of possibilities in training and courses offered, and what benefits to the firm this would generate. Furthermore, MEPhI should give more attention to marketing, financial management, international management and foreign languages in its curriculum. This should not be limited to related faculties, but should encompass faculties with completely different orientations. Lastly, the support structure could organize announced seminars or workshops.

It was said that the above mentioned skills are not frequently available at firms, and the skills that are available often reside in the director himself. It is not realistic to believe that a director who graduated in engineer-physics can perform all marketing, financial and international management tasks by himself in a successful manner. The firms should attract more employees who possess these skills, or train current employees to become skilled in these areas. This will divide knowledge throughout the company and enlarges chances of truly adequately skilled persons in the right places.

6.1.4 Social Network

Understanding networks

The support structure should show the benefit of networking to the firms. This could be done by promoted workshops, seminars, and much more attention to networks in the curriculum and courses offered. The focus should be on how networks increase the availability of resources. Again, the mentors and consultants have an important role to play to point out where firms could gain advantages in networking with others.

The firms themselves have to learn to function in interaction with others instead of in isolation. They need to attract partners with diverse resources, which will create a much clearer picture on how to value networks.

Relationship maintenance

Once the firms understand the usefulness of having access to resources from network partners, they will automatically value their relationships differently and will put more effort in maintaining good contacts with them.

6.2 The system

It was pointed out that most recommendations on operational level are already present in the current support structure, but need to be adapted to some extent. This involves mentors and consultants who need to be properly educated and experienced themselves. It also concerns the curriculum, where more attention should be paid to the essential subjects mentioned. Another already existing tool to be developed further is RTTN, which needs to be promoted and enlarged to be truly helpful in locating investors for companies.

A tool still to be developed at the entrepreneurial support structure is a monitoring system. A team should be assigned to regularly evaluate firm performances and discuss appropriate measures with the firm in question. This is of importance in the starting phase of a company, when the future might be uncertain and extra help is needed to formulate and adapt strategies. Furthermore, Technopark could start to establish workshops and seminars to create meetings where relevant parties get acquainted with each other.

The above mentioned activities can all be carried out by Technopark. In order to be successful, Technopark needs to be embedded in a system on a higher aggregation level which integrates and directs all tools to the same goals. It is essential that the system and its activities are promoted throughout participants and externally. This leads to more usage of tools and expansion of activities.

6.2.1 Mission

In the current situation, students are more important to MEPhI than spin-offs. This is because each student pays for his or her placement, with minimal extra efforts from the institute. The companies only pay rent, which is less than what the sum of all students pay. MEPhI must realize that successful spin-offs could give a real boost to MEPhI. The structure should integrate all tools into a system with clear goals. The mission of MEPhI is to 'advance learning through the integration of teaching, research and service to others'. If MEPhI has a true intention to commercialize knowledge and to internationalize spin-offs, it should be reflected in this mission in one way or another. This will cause an increase in spin-offs and better interaction between Technopark and MEPhI, that will benefit the support structure. In this way, the suggested recodmmendations have more chance to succeed, which will enhance business characteristics for internationalization.

6.2.2 Knowledge park

Currently, Technopark and MEPhI do not really have the possibility to act as a broker to actors with very diverse resources because the network is mainly technologically oriented. They should explore the possibilities of cooperation with other universities, institutes or companies in the region with different specializations to increase synergetic effects and to indirectly increase the networks of the firms from which they can attract diverse resources. These universities, institutes or companies should ideally be specialized in fields where Technopark and the companies currently fall short. This is also necessary to be able to attract the necessary qualified mentors, consultants and monitoring teams. Cooperation possibilities include exchange programs of students and teachers or joint projects between companies. MEPhI and Technopark should try to establish and infrastructure with these institutes, universities and companies to encourage more interaction and to create an entrepreneurial and inspiring environment. In this infrastructure, they could promote and suggest projects to enhance activities. The network will push all participants further and, when successful, will attract the attention of investors and other parties beyond the region and from abroad. The firms can optimize their capitals with resources from others to increase chances of successful international collaborations. Such an entrepreneurial environment does not only support start-ups, but established firms as well.

6.2.3 Accelerator

MEPhI could introduce accelerators for businesses with international potential. Technopark could scout suitable companies and invite them to a special program directed at internationalization. Considering the size of Technopark, this program should not be very extensive and should add to the business characteristics developed in the previously mentioned recommendations. The accelerator is actively involved in establishing valuable foreign contacts, targeting and examining foreign markets, creating international strategies, and establishing international management patterns of behavior. Also, when on business trip abroad, the accelerator is actively promoting the activities and products of its program participants.

6.3 Conclusion

All recommendations given in this chapter enhance necessary characteristics for internationalization that Techopark firms currently do not sufficiently possess. Qualified mentors and consultants aid to improve strategic understanding, market orientation and international orientation, but also skills in marketing, financial and international management. Having a clear strategy with clear attention for the market and an international plan increases chances for successful international partnerships, as do foreign language skills, ability to organize its financial management and marketing. When these

fields are integrated into the general curriculum of MEPhI, this will enhance understanding and skills of future spin-offs as well. Established firms can benefit from organized seminars or workshops where special attention is paid to theses subjects. But first, Technopark needs to make the firms aware that participation in these seminars and workshops can increase their performances and chances of successful internationalization. This is connected to the next point, namely that Technopark should actively promote its activities in order for the firms to actually use them. Furthermore, formal monitoring teams guide start-ups in their process of strategy formulation in their early stages of development when the future is still uncertain. Having clear goals is an absolute prerequisite for foreign partners. In addition, RTTN needs to be severely promoted to include more investors and for all to use it. Having access to more investors decreases any financial burden, which will not have to be solved by foreign partners. Also, when RTTN is bigger, it is a useful instrument to locate foreign partners directly through BRIN and RFR. Last, MEPhI should make long-term rent agreements with the firms in order for them to make more accurate financial forecasts, which is helpful in making agreements with foreign partners.

These operational tools are embedded in a larger system. Technopark and MEPhI should cooperate more so that all is directed towards commercialization in which internationalization is recognized as an important matter. Technopark has clear goals in this area, but the mission of MEPhI values students over spin-offs. If MEPhI adapts its mission, better integration of activities of MEPhI and Technopark is possible. This is important in the curriculum, but also to create a knowledge park in which there are close contacts between universities, institutes and companies in the region. Of course, this requires efforts from external parties as well, but Technopark and MEPhI could act as one of the initiators. It will create an inspiring and entrepreneurial environment in which parties with different kinds of resources have synergetic effects on each other. Technopark firms can attract their necessary resources for internationalization that they currently lack. Within the system, MEPhI and Technopark should consider the introduction of an accelerator for internationalization, that scouts firms with international potential and includes them in a special program where much attention is paid to establishing foreign goals, establishing foreign contacts, investigating foreign markets and enhancing international management skills and foreign languages. The accelerator is also actively involved in promoting the firms and their activities abroad.

In sum, it could be said that many activities to enhance internationalization are already present, but need to be adapted to include truly qualified persons, or need to be promoted more. On a higher level, Technopark and MEPhI need to collaborate more. MEPhI should adapt its mission to create a system in which the activities can really be integrated with each other. Both can create a knowledge park with contacts with other universities, institutes and companies. In addition, an accelerator can actively scout for firms with international potential, and help them further.

Chapter 7: Conclusions

This report elaborated upon the characteristics of the firms at Technopark and to what extent these business characteristics were developed to commercialize products or services abroad with help of an international partner and the MEPhI entrepreneurial support structure. The main question of this research was as follows:

'What characteristics of Technopark firms should be improved for international collaboration and what role can the entrepreneurial support system play in this respect?'

This chapter summarizes the main findings and answers the central questions. Furthermore, the practical and theoretical value of the research will be discussed. Limitations are elaborated upon, and suggestions for further research are made.

7.1 Summary

7.1.1 Problem and objective

The problem as indicated in chapter 1 was that despite possibilities for international competitive advantages through cheaper or new technologies, there is an unsatisfactory level of international commercialization of knowledge developed at Technopark firms. More internationalization could lead to more growth and development. The objective of this research was to provide recommendations to enhance internationalization of Technopark firms with help of a partner and the MEPhI entrepreneurial support structure.

7.1.2 Theory

The theory chosen in chapter 2 was the 4S model because of its multi-dimensionality and the offered guidelines to construct collaboration in which actors have synergetic effects on each other. The 4S model states that a social system can only survive when strategic, economic, cultural and social network capitals are sufficiently developed and where the capitals of various actors in a network are compatible to each other. All capitals are interrelated to each other and change in one capital triggers change in another capital. The 4S model was also used for the entrepreneurial support structure, because of the possibility to add multiple actors to the system in which all have synergetic effects and fill each others gaps. In addition to this, entrepreneurial support activities for a successful spin-off program of Broekstra et al. (2002) were used to describe in what way the system could aid Technopark firms. Mentorship, monitoring, training and counseling, networking, knowledge, availability of finance and access to finance are instruments to fill any needs of the firms.

7.1.3 Method

The research was a multiple case study in which ten Technopark firms, four Dutch companies and the MEPhI entrepreneurial support structure were investigated, as was outlined in chapter 3. Selections of firms were made according to sectors of operations and recommendations of specialists. The Technopark firms were researched first by means of interviews, to analyze their capital situation and requests for partners. After this, a possible Dutch partner from the Twente region was found, whose capital situation was also analyzed to detect fits and misfits with the Technopark company. It was only possible to find potential partners for three out of ten Technopark firms, namely Quarta-Rad, Eskiz-MEPhI and OKC Service. They were tied to C-it and Steray, RWB Waterservices, and Bitkwadraat, respectively. Desk research provided a first acquaintance, but to obtain in-depth information, interviews were held with company directors. The support structure was investigated through desk research and interviews with the director of Technopark and its staff, to see what instruments were available and in what way necessary characteristics are enhanced.

7.1.4 Analyses

Analyses in chapter 4 showed that Technopark firms lack certain characteristics for internationalization that were defined by theory. In the scope dimension, they lack strategic understanding. Strategies are very push-oriented and do not provide guidelines for operation. In collaboration with Dutch firms, a solid long-term strategy is required and the firm must have a clear competitive advantage. Technopark firms believe in their competitive advantages, but they are not reflected or communicated in their strategies. Also, the firms score high on the MRKTOR scale of Narver and Slater, but their strategies neglect customer and competitors. It seems that the strategies of Technopark firms are not complete. In this way, it is difficult to make clear agreements with foreign partners. In addition to this, the firms do not publish anything in foreign languages, which makes them difficult to locate for foreign companies.

In the scale dimension, the firms need more investments. There are too many needing companies and too few investors. Also, Technopark firms are reluctant to give up power, which makes it more difficult to find an investor who might inject more resources to the firm. It is in the interest of a Dutch partner that the Technopark firm has sufficient financial resources in order to balance investments of the joint project. Furthermore, several companies do not operate as efficiently as desired because of area and rent issues with MEPhI. This also influences the efforts made in collaboration with a Dutch company. The Dutch firms are reluctant to share monetary resources with partners, which is why it is of the utmost importance that Technopark firms can solve this issue themselves.

In the skills & values dimension, technical skills are very well developed, but entrepreneurial skills are not. There is very little educational background in marketing, financial management and international management, including foreign languages. When these skills are present, they often reside in the director, who is a physic-engineer in the first place. Skills are not optimally distributed. Although Dutch firms are better entrepreneurially skilled, they also often lack marketing skills. Further, financial management cannot be done by the Dutch partner, because both parties do not want to share money and the Russian firms are very unlikely to open their documents to foreign companies. Last, lack in international management skills cannot fully be compensated by Dutch firms who are skilled in this area, because all cultural flexibility cannot come from one side. The Technopark firms must also create a feeling of working with foreign companies. Communication between Dutch and Russian firms will be very difficult if the Technopark firms do not improve their skills in foreign languages. Direct communication without interference of translators would enhance trust between the firms.

In the social network dimension, the firms do not seem to fully appreciate the benefits and resources that good networks can bring. Their networks are very technically oriented and bring redundant resources. Dependent from the partnership, Dutch firms can provide indirect access to various resource-full ties and act as an example to overcome anxiety of sharing with others. Currently, the Technopark firms would like to operate in isolation as much as possible. Furthermore, the Technopark companies have weak relationships with their network partners and do not make efforts to maintain a relationship. Again, Dutch companies could serve as an example how good relations benefit the firm.

7.1.5 Support structure

The MEPhI entrepreneurial support structure has tools to improve some of these gaps, but not all of them. This was indicated in chapter 5. The most important support instrument is Technopark, in which the business center, the educational-consulting center and the student incubator of high technologies collaborate to provide support to MEPhI spin-offs. At MEPhI itself, the faculties and the Center of Student Initiatives provide inputs for these spin-offs. Last, RTTN is a technology transfer network for partner and investor search that was initiated by Technopark.

The available mentors and training and counseling could aid in the strategic understanding, market orientation and international orientations of the firms, as well as in developing marketing, financial management and international management skills. Nevertheless, the firms themselves are not aware of their shortcomings in the scope dimension and will not use the available tools. Furthermore, the current support does not include promotion of publishing in English and little attention is paid to foreign languages. In the skills dimension, the firms are more aware of their problems, leading to the fact that they might use the existing instruments. However, the mentors and consultants are not adequately skilled themselves, and the help offered by Technopark is not universally known among the Technopark participants. Official monitoring could also aid start-ups in their strategies, but this is not offered by Technopark.

RTTN is a useful instrument to gain more access to investors and to enrich and enlarge the firms' networks. However, the network is not known or used extensively. Further, Technopark aids in finding investments through funds, which are only once occurring. In addition, the support structure is responsible for the area and rent policy, but there are no plans to adapt the current situation that might improve firm efficiency. Similarly, there are no activities to enhance the understanding of networks, or how to maintain relationships.

7.1.6 Recommendations

It was pointed out in chapter 6 that minor adaptations of existing tools can improve business characteristics to increase chances of successful internationalization. First of all, MEPhI needs to include strategic subjects and marketing, financial management and international management into its curriculum. This includes foreign language skills, and should be meant for students in all disciplines. Also, if MEPhI and Technopark enlarge their networks to include more diverse resource-full ties, they can attract mentors, consultants and teachers with synergetic specializations to their own. When these have adequate strategic understanding that includes market and international orientation, and have good entrepreneurial skills, they can guide Technopark firms to improve their characteristics in these areas. It is also the task of these mentors and consultants to detect short-comings in start-ups. Established firms do not appreciate this kind of guidance and need to be aware of short-comings first before requesting consultation. Technopark can express their concern, or organize well promoted seminars or workshops. In general, Technopark should promote its activities more in order for the companies to be more aware of possibilities offered. Furthermore, RTTN should be developed and promoted further to enlarge the member base and to increase chances of successful localization of investors or partners. This directly increases internationalization, or helps to improve the financial resource position so that this is no longer a burden to a foreign partner.

A monitoring team is to be newly assigned to evaluate start-ups and to give close guidance to their strategy formulation. Furthermore, MEPhI should make long-term rent agreements with the firms in order for them to know what to expect on the long run. In this way, making agreements with partners becomes easier.

All tools are embedded in a larger system. MEPhI could adapt its mission to give more importance to commercialization, also abroad. In this way, Technopark and MEPhI are likely to collaborate more, and activities will be better integrated. In addition this internal collaboration, Techopark and MEPhI could try to establish an external network to include universities, institutes and companies in the region who all have different specializations. This enables Techopark firms to attract resources that they currently lack, and will increase chances for successful international partnerships. Also, a successful knowledge park will attract more foreign attention. Last, an accelerator can be created to scout for firms with international potential and to provide them special guidance with the aim of internationalization.

7.1.7 Answering main question

At this point, the central question can be answered. The first part of the central question asks what characteristics of Technopark firms should be improved for international collaboration. In the scope dimension, Technopark firms could improve their strategic understanding, including market and international orientation. They should communicate or adapt their competitive advantage and include customers and competitors into their strategies. The strategy will become more operative, which is necessary in collaboration. Furthermore, they need to publish in foreign languages to be more accessible to foreigners. In the scope dimension, firms need to gain more access to financial resources to decrease the burden of partners in collaboration. Also, they need a clear area and rent policy to be able to operate more efficiently. In the skills dimension, Technopark companies need to improve their skills in marketing, financial management and international management, including foreign languages. These skills need to be optimally divided amongst employees. In the social network dimension, companies need to gain a better understanding of the importance of networks, and what benefits additional resources from these actors could bring. Also, they need to maintain their relationships better.

The second part of the central question asks what role the entrepreneurial support system can play in improving business characteristics for internationalization. The entrepreneurial support structure can play a major role in enhancing these characteristics. Existing tools can be adapted to provide appropriate mentors and consultants that overcome the problems outlined in the scope and skills dimensions. These areas can also be included in the curriculum of MEPhI, to benefit future spin-offs. Last, RTTN needs to improve and enlarge to increase chances of finding investors and foreign partners. New instruments also need to be developed. There needs to be an official monitoring team to evaluate start-ups and to detect strategic short-comings. The team helps to take appropriate measures. Also, MEPhI needs to develop a solid long-term rent agreement after which firms can make long-term agreements with others.

MEPhI and Technopark need to collaborate closely, which can only be done when MEPhI adapts its mission to include commercialization, also abroad. Externally, MEPhI and Technopark could initiate a knowledge park that encomprises regional universities, institutes and companies. Technopark firms can attract necessary resources from this diverse network. Last, MEPhI and Technopark could create an accelerator to scout for firms with international potential and give them close and appropriate guidance to optimally use the firm's potentials.

7.2 Practical and theoretical value of the research

7.2.1 Practical value

The results of this research can be used by MEPhI and Technopark and the firms of Technopark. This research provides an insight into the factors that play a role in internationalization. The firms could make an effort to improve these factors and thus increase chances of successful internationalization. But most of all, Technopark and MEPhI can use the results to create a better entrepreneurial support structure that suits the needs of Technopark firms better. Suggestions were made in this report. A good entrepreneurial support system will not only benefit the current Technopark firms, but also the next generation of spin-offs. Furthermore, it aids the firms in their attempt to overcome their problems, as tools are provided to them through the system. In the end, this will increase international commercialization of knowledge, which was indicated as unsatisfactory at the moment.

This report is also of practical value in the sense that it illustrates differences and similarities between European and Russian business culture. Despite the fact that these illustrations serve as a minor aspect of the research, Chapter 1 introduced several examples of differences to gain more understanding for the rest of the report. Some of these examples were confirmed in my findings, some were not. For instance, this report supported the prediction that interaction between science

and industry is not optimal in Russia, and that scientists are more interested in pushing new products to the market than to solve customer needs. In addition, spin-offs at Technopark indeed receive little financial aid from MEPhI or Techopark because MEPhI is a state university, where the little money available is spent on basic things rather than on international expansion. Furthermore, Technopark firms do have few patents because of expenses. The firms have indicated that they would like more international patents but are not in a position to do so. Last, this research disproved the expectancy that Technopark firms value social relations very much to overcome Russian uncertainties. Technopark firms do not have many relations, nor are they very strong. Rather, the firms protect their knowledge through secrecy and social relations do not appear to be very important. The firms operate as independently as they can.

7.2.2 Theoretical value

This research uses the 4S model in an international context, which has not been done before. This research showed that it is possible to use the 4S model in an international context, although it raises several questions. Questions could be asked about the valuation of capitals in different contexts. It was seen that networks are valued differently in Russia and in the Netherlands, which influences the way how companies deal with their networks. More research could indicate whether or not this also influences the threshold value of social network capital in these countries. Furthermore, it was seen that the 4S model can easily be integrated in the adapted EFQM model of Broekstra et al. (2002), of which only a part is used in this research. This shows once more that the 4S model is very broadly applicable and can be adapted to the research question at hand.

This research showed that it is possible to score high on the Narver and Slater MRKTOR scale, but still be more product oriented than market oriented. This is because the scale does not include any views from the customer and leaves all answers to the interpretation of the firm itself, which might not be fully compatible to its actual activities. Furthermore, it could be connected to the fact that the Technopark companies believe in their superiority and regard the phenomenon of competitors as non-existent or not important in their circumstances. This severely influences the answers to MRKTOR questions about competition. As many innovative companies believe that there is no competition, or that there really is no competition, the questions of MRKTOR on this aspect lose their meaning.

There are similar problems to the Lumpkin and Dess scale on entrepreneurial orientation. Questions on proactiveness and competitive aggressiveness include reactions on existing competitors, which leaves room for bias in case of innovative companies.

7.3 Limitations

The previously mentioned problems with the MRKTOR scale and the Lumpkin and Dess scale on entrepreneurial orientation influences the results on these indicators. The firms are less market oriented than one might presume from the MRKTOR results. On the other hand, the firms might be more proactive or competitively aggressive than one might assume from the Lumpkin and Dess scale.

In addition, it was difficult to obtain information on the Russian side because of communication problems. There are no guarantees that existing scales convey the intended meaning after translation into Russian and it was very difficult to make appointments. Furthermore, the interviewees did not want to answer all questions, such as those on financial data. Also, the research suffers from single informant bias. The directors did not understand the necessity to interview employees of the firm because they would not be able to provide more information. On a higher aggregation level, however, there were more directors in the research to put the answers into perspective.

The research suffers from asymmetry. The Technopark firms did not know to what Dutch firm they would be linked, making sensible discussions difficult. On the other hand, the Dutch firm knew what company it was linked to. This provided possibilities to explore a potential fit in-depth, but only from the Dutch side. The Dutch selection was not at all representative of available firms in the Twente region. Another partner might have been able to fill completely different gaps or have a completely different capital situation. This is of influence to the recommendations made. It must be repeated however, that this is a case study and is not to be generalized beyond the context of Technopark.

7.4 Suggestions for further research

The threshold value of the capitals is not yet known. It is already widely agreed upon that this area needs more research. However, there is also a need to explore if contexts influence this threshold value. Research could prove whether or not there are different capital requirements in Dutch or Russian companies. If their optimal capital situation differs from each other, the question is what the optimal capital situation would be in collaboration. Furthermore, there should be more research on whether or not the same possession of resources could lead to different weights in capital in different contexts.

Another suggestion for further research is the validity of MRKTOR scale of Narver and Slater and the Lumpkin and Dess scale for entrepreneurial orientation for starting innovative companies. This is because they lack competition, or believe they lack competition, which influences the indicators used in these scales. A scale should be developed in which observations of behavior correspond to the actual results from this scale. This means that the indicators should be based on this actual behavior, and not on perceptions of the respondent on its own behavior.

As was indicated in chapter 2, entrepreneurship scholars and international business scholars are seldom involved in joint research. Combined research by specialists from both disciplines would provide unique theoretical linkages that could be very useful to the understanding of the internationalization process of spin-offs. This is an opportunity for NIKOS, who has close access to both specialists. NIKOS could stimulate convergence of these fields of science in order to produce unique insights into this internationalization process of spin-offs.

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List of interviewees

Afanasiev, Vladimir Stepanovich	Teros MEPhI	By Georgy Chitlakov
Gegrambekov, Leon Bogdanovich	Lidasa	
Beld, Jeroen van den	Septo	
Belonogyi, Piotr Nikolaevich	Eskiz-MEPhI	By Julyia Chistyakova
Benthem, Jann van	NIKOS	
Bliek, Patrick	NIKOS	
Chornakov, Viktor Alekseevich	Eniko TSO	By Nikolay Parshukov
Eijkel, Kees	Knowledge Park	
Golotyuk, Oleg Nikolaevich	Technopark	
Golovanov, Vitalyi Alekseevich	Quarta-Rad	
Gritchenko, Fiodor Anatolievich	OKC Service	By Masha Matveeva
Jansen, Jan Wouter	Bitkwadraat	
Lagunchov, Nikolay Ivanovich	Aquaservice	By Natalya Kalmikova
Lebedev, Grigoryi Nikolaevich	Technopark	
Mitko, Sergey	Steray	
Moshnin, Michail Vitalievich	Aleksandr+	By Masha Zelenkina
Novikov, Igor Kimovich	Lekis	By Misha Denkoff
Oord, Henny	C-it	
Oudalov, Yuryi	Steray	
Petrovskyi, Aleksandr Nikolaevich	Technopark	
Reigersman, André	RWB Waterservices	
Romkema, Harry	Topicus	
Tilburg, Jaap van	Technologie Kring Twente	
Tolstikov, Vladimir Vasilievich	MEPhI Ineco	By Evgenyi Kornilov

World Wide Web

- http://park.mephi.ru
- http://webhare.axis.nl/kennispark_n/Starten_en_groeien/Groeien%20met%20kennis/Kansenzone-1.doc/
- http://webhare.axis.nl/kennispark_n/Starten_en_groeien/Studenten/onderwijs.doc/
- http://www.kansrijkeigenbaas.nl
- http://www.kennispark.nl/overkennispark/
- http://www.kennispark.nl/overkennispark/Doelenprogramma/
- http://www.kennispark.nl/overkennispark/Initiatiefnemers/UT.doc/
- http://www.kennispark.nl/overkennispark/Organisatie/
- http://www.kennispark.nl/Partners/BTC.doc/
- http://www.kennispark.nl/Partners/Businesspark.doc/
- http://www.kennispark.nl/Partners/TKT.doc/
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- http://www.utwente.nl/nikos/about/mv.doc/2.html
- http://www.utwente.nl/niko/bds/
- http://www.utwente.nl/niko/bds/femstart.doc/
- http://www.utwente.nl/top/general_information/initiation.doc
- http://www.utwente.nl/top/general_information/network.doc
- http://www.utwente.nl/top/general_information/relationship_with_the_university.doc/
- http://www.utwente.nl/top/general_information/step_by_step_programme_procedures.doc
- http://www.utwente.nl/top/general_information/the_offer.doc
- http://www.utwente.nl/top/information_for_applicants/top_selection_criteria.doc/

Appendices

Appendix 1A: Goals of Technopark

Goals of Technopark
• Preservation of science potential of MEPhI
• Forming a market of ideas, scientific and technological projects and innovations
• Creation of an encouraging environment for new entrepreneurs in the high-tech sector
• Development of international scientific and technological relations, transfer of native technologies to foreign markets
• Full support of student initiatives in the sector of high-tech enterprises, forming an innovative culture for graduates

Source: http://park.mephi.ru

Appendix 1B: Fields of operation

Fields of operation
• New materials
• Technology of material processing
• Information science
• Devices for technology monitoring and management
• Devices for scientific research
• Ecology safety
• Devices for medicine
• Measuring technique
• Innovation management (education and consulting)
• Devices for municipal services
• Simulators for APPs and military techniques
• Goods for national consumption

Source: http://park.mephi.ru

Appendix 2: Four dimensions of Entrepreneurial Networking

Four Dimensions of Entrepreneurial Networking

Dimension	*Relates to*	*Capital*	*Resources*	*Some interventions*
Scope	Strategic goals	Strategic capital	Power, authority, influence, strategic intent	Using power Redefining strategy
Scale	Economic optimization	Economic capital	Money	Using financial incentives Cost cutting
Skill & Value	Institutions and pattern maintenance	Cultural / human capital	Values, organization, knowledge, skills, experience, technology	Training & education Teambuilding Organisational systems New technology
Social network	Interaction pattern / process	Social capital	Contacts (multiplex, filling structural holes, cohesive, equivalent)	Relation management Changing network structure Using brokers Supply chain mngt

Source: Groen, 2005

Appendix 3a: Interview Protocol

INTERVIEW PROTOCOL

This protocol offers guidelines for interviews to be conducted by the students who will participate in the visit to Twente in June 2007. The framework of the interviews will be explained, some principles of survey research will be elaborated upon, and the questions will be presented, including the reasons for including these questions and what information it should provide.

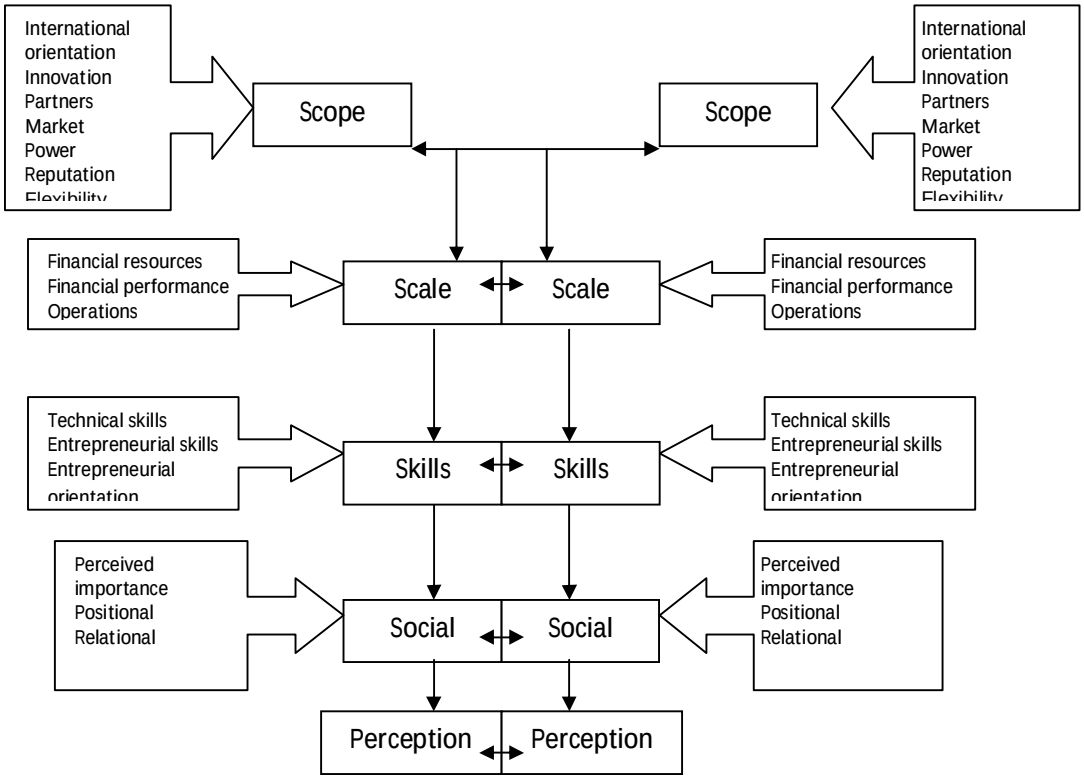
The study
The interviews will be held in the framework of a study conducted by BA Mariska Roersen, Master Student Business Administration in Innovative Entrepreneurship & Business Development at the University of Twente, supervised by Dr. A.J. Groen and Dr. Ir. J. Kraaijenbrink. This study is conducted within the project between MEPhI and the University of Twente on entrepreneurship in networks. At this point, the orientation phase is concluded in which literature search was the main activity.

There are many spin-offs at the TechnoPark of MEPhI, which possess high quality technical knowledge and the products are sophisticated enough to be able to compete on the global market. However, the connections in the international market of some of the firms are not yet fully developed. Therefore most of the products and knowledge developed at the spin off companies are not yet known in international settings. In order to commercialize abroad, the networks of the spin-offs need to be more internationalized. In this project the aim is to research if developments of such relations are possible in collaboration with spin offs at the University of Twente.
This study will analyze the business characteristics of 10 participants of TechnoPark in the water purification, medical and computer simulators industry with help of the 4S model. Once there is a clear overview of the scope, scale, skills & values and social network dimensions of these 10 companies, it becomes possible to search for potential partners in Twente. For this, the scope of the company will be used as a first orientation point, as the companies in Twente should have a similar or complimentary strategy. In addition to this, the entrepreneurial support structure of MEPhI will be examined. After the business characteristics of the companies are known, it can be identified in what way the spin-offs need help from MEPhI. Then, it will be investigated whether or not MEPhI in fact does offer this help, and how it could be improved to meet the needs of the TechnoPark participants in a better fashion. In this study, it is of importance to investigate the degree of internationalization of the companies and their potential thereof. In this interview this will be a key issue. Finally, the study will provide a tool for MEPhI spin-offs to collaborate with international partners with the help of business development.

This interview will provide the basis of identifying the business characteristics of the participants of TechnoPark and will influence the rest of the study. The research will be finished in July/August 2007.

Sponsors
This study is conducted in the framework of CROSS (a project of the Dutch Ministry of Economic Affairs to promote knowledge transfer between the Netherlands and Central and Eastern Europe, and Russia), in which the project between MEPhI and the University of Twente is embedded. More specifically, NIKOS of the University of Twente and MEPhI are the sponsors of this research.

Survey Research
The interview is composed of several parts. The goal is to examine the strategic, economic, cultural and social capitals of the companies at TechnoPark and to see what contributions MEPhI and/or a partner could make in this respect. The following model forms the basis of this interview.



Obviously, scope, scale, skills and social network derive from the 4S model. The factors composing the four capitals are derived from various theoretic models.

Strategic capital:

The operationalization of the strategic dimension is based on two things: What are the goals of the company and what is the ability of the company to persuade other actors to achieve these goals. First of all, there are 4 different orientations in the goals as a complete strategy should take into account innovation, competitors, partners and customers. The orientation towards competitors and customers can be combined into market orientation. Insights into all of these orientations offers a more complete understanding of the goals of the company and provide a better starting point from which to compare the goals of the spin-off companies at MEPhI and the companies in Twente. For instance, if the only orientation measured was the strategy towards competitors, both companies could agree that they want to stay ahead of competing developments, but they could disagree on the importance of the customer. The latter could lead to friction in collaboration, so should be taken into account. Secondly, there are three ways related to the ability of the company to persuade other to achieve the preset goals. These are power, reputation and flexibility. In all components the international aspect can be distinguished.

Economic capital:

The economic dimension of the model relates to the efficiency of operations. For this reason, it is necessary to know how the funding of the activities of the company is divided.
Furthermore, it is of importance to know how big the company is when measured through its financial performance to be able to seek appropriate partners. This partner does not have to be the same size. It could be, for example, that one company is too small to do business with another firm in another country, and the second company under investigation could serve as an intermediary between the two.

Cultural capital:

This section provides information on the skills possessed and the values treasured by the company. An adequate picture of the skills and values is helpful in assessing the potential for collaboration with a company in Twente. The skills should be compatible with each other. This does not mean that both companies should have the same skills. It would be better that the partner possesses skills that the

other party lacks, thus creating synergy. The other can overcome the shortcomings of the first, thus helping each other. The values, however, should be compatible. If both partners do not share the same values, different sets of priorities seem inevitable, probably leading to misunderstandings and to differences in strategy on the long run. Special attention is given to international orientation, as it is a key aspect of this research.

Social capital:
Social capital can provide access to resources that the company can utilize, employ or enjoy. It is important to know to what extent the company is able to benefit from resources from its network partners and to what extent the network is international. For this reason, the position of the company within the network should be analyzed, as well as the relational aspects of the network. Also, the perceived importance of the network within the company plays a vital role in exploitation of it. For instance, when an actor has a prominent position in a network and maintains strong ties with its network partners, the chances are bigger that this actor can benefit from the resources from others to a higher extent. However, weak ties are also important, as these are helpful in recognizing opportunities. When an actor does not appreciate the value of its network, it cannot be exploited to its fullest and opportunities are lost. Various types of networks are beneficial for various things, and the companies from MEPhI and Twente should have social capital that is complementary to each other, not necessarily the same kind of capital. What social capital is needed from the other partner depends on the needs of the first partner, which is only to be discovered at a later stage.

To make sure the interview runs in a smooth and logical way, the questions that deal with these capitals are divided in other subjects, namely the company, input, the network, the future and the role of MEPhI and the partner, with the subject of internationalization dealt with throughout. For several questions a lengthy answer is not needed, which is why there is an interchange of open and closed questions. The open questions will be posed by the interviewer, after which a form is handed to the interviewee to fill out the closed questions himself. Then, there will be open questions again, after which another form with closed questions will be given to the interviewee. This repeats itself. Acting in this fashion will be a pleasant interruption of the somewhat lengthy interview. It is important to give the right lists at the right moment, as the open and closed questions deal with similar subjects, so as not to confuse the interviewee. It is not allowed to read the closed questions yourself and write down the answers, as this will give an unprofessional appearance and will take much more time than when the interviewee was to do it himself. Last, this protocol provides extra texts between the questions. This is meant to help the interviewer understand why the questions should be asked and should not be read. Sometimes, it is explicitly said what the interviewer should say in order to make transitions between subjects smoother.

Specific attention is given to the phrasing of the questions, so that it will steer the interviewee towards giving a useful answer. For instance, the questions are neutral, as human beings are psychologically inclined to answer a question positively. The following example can be used to illustrate: *Did this company ever convince partners to adapt their strategy to better meet the strategy of this company?* The interviewee is tempted to answer with yes. Therefore, the question is added with: *Or not?* This addition makes the question more neutral. For this reason, it is important to ask the question in the same way as it is written down. Be aware that the interview remains natural, so do not read the question from the paper. Good preparation is essential.

Underneath several questions, answer indications are given composed of key words. If the interviewee is answering the question in a complete other way, the interviewer should probe the questions necessary for the interviewee to answer the question in the way that it was initially meant. An example is the question: *What marketing segment is the company targeting at?* The answer indication is *Business to business, Business to customer, car owners, etc, as long as it concerns customers and not products.* When the interviewer answers this question by: *"The company is targeting at people who want to use these filters in their homes to purify water"* the focus is on the product, namely the filter. The interviewer should probe as follows: *"Who are the people who would want these filters in their homes?"*

Each subject starts with more general questions, to introduce the subject. It could be that the interviewee does not know anything about this subject, which becomes apparent during this general question. It is possible to try one or more specific questions to check if the interviewee might know about these questions. If not, it is not allowed to continue with the questions of this subject. It might make the interviewee feel insecure and that is not a good basis for the interview. Furthermore, the answers that might be given would probably not be valid. However, it could be the case that the interviewee remembers things about this subject because of other questions asked during the interview. For this reason, it might be useful to come back to these questions at the very end of the interview.

It could be that the interviewee is talking too much about a subject that you already have the necessary information of. It is not rude to stop him at a certain moment. For example: *"There is an interesting story that you might like. Five years ago…"* You: *"I am sorry. This story sounds very interesting and I would love to hear about it some other time. For now, I would first like to talk about…"* However, it is important to always be respectful to the respondent and to make him feel good about himself.

The opposite could also happen. The interviewee could stop talking whereas you do not have the necessary information yet. In this case, it is often useful to remain silent. This is called 'silent probing'. In many cased, the respondent will automatically continue his story and tell more. If this does not happen, you should probe questions. There are several means to do this. You could ask more general questions, such as: *"Could you tell me more about this?"* or you can repeat what the respondent has said. *"So, as I understand correctly you believe that this company is adequately skilled in financial management."* It is likely that the respondent will tell you why he believes that the company is adequately skilled in financial management. Of course, you can also ask specific questions: *"Why do you think this company is adequately skilled in financial management?"*

Sampling
These 10 participants of MEPhI were chosen because of the industry they operate in. For convenience, the companies should operate in only 2 or 3 sectors, as it would be too much to grasp to look for potential partners in 10 different industries within the time span allocated for it. Furthermore, to have 2 or 3 sectors is better than only 1 sector for generalization purposes. Each of you will be assigned to one company and if it is possible you are requested to have interviews with multiple people within this company.

Interviewer bias
Interviewer bias is intentional or unintentional prompting by a researcher, which affects the interviewee's response during oral surveys. As said previously, the questions are as neutral as possible in order to prevent the interviewee from answering in a way that he thinks is the "good" answer. It should be clear that there are no good or wrong answers. Unfortunately, there are many other ways to influence the interviewee apart from the phrasing of the question. The tone of voice of the interviewer can influence the interviewee to answer in a certain way. Conflict avoidance and (over-) politeness can also cause interview bias. It is important to be aware of the fact that these actions might distort the results of the interview. It is not possible to completely overcome interviewer bias, but it should be tried to be as neutral as possible and not to direct the questions towards an expected answer.

Language
This interview is written in English. It is allowed to conduct this interview in the Russian language, as not all respondents will manage the English language adequately. Try to stay as close to the English meanings as possible.

Interview class
After everybody has read the interview protocol, including the questions, there will be a class organized to "walk through" the interview. It is recommended to ask all questions you might have about this protocol. Furthermore, the interview will be rehearsed. It is good to talk to each other about the interview and to make sure that everybody understands it in the same way, in order for all

interviews to be conducted in a similar fashion so that the results of different interviews can be compared. It is very important that each of the interviewers is very familiar with the entire interview before in fact interviewing somebody.

Supervision
I will provide all of you with my contact details. I will arrange a weekly meeting with you and besides these I will be available for any questions or problems.

Schedule
This interview project will start around the 18th of April. You are requested to start the interviews as soon as possible, as all interviews have to be completed and analyzed before May 20th.

THE INTERVIEW

Explain briefly who you are, what the goal of the research is and in what framework this research is done. Explain that there will be several subjects during the interview that you would like to talk about.

The company
Explain that you would like to something about the company to begin with. The first questions are general, as to get an idea who the respondent is. This is important for putting the answers in the appropriate context.

1. Could you briefly describe the activities of the company?
2. Could you briefly describe your function within the company?

The strategy of the company is the first acquaintance. We want to know whether the goals were met or not to predict the likeliness of the meeting the current goals. Furthermore, a general picture of the goals of the company will be gained, which will be a first orientation point for looking for compatible companies in Twente.

3. What were the main goals of the company when it was established?
    a. To what extent are these goals met?
4. What are the short-term and long term goals of the company?
   Answer indication: product-market combinations (specific offer for a specific segment in the market), ambitions for growth, innovativeness, technology, internationalization and reach within the market.

   Write down the answer, because it will be elaborated upon in the last section.

5. Does the company have any goals in the foreign market, or not? If yes, what are these goals?
6. What market segment is the company targeting at?
   Answer indication: Business to Business, business to Consumer, but also hospitals, elderly people, youth, car owners, the possibilities are endless, as long as the answer concerns characteristics and types of customers, and not about the products of the company. It is important that the answer is as specific as possible

    a. If any, what foreign market segment is the company targeting at?

The following question indicates one aspect of whether or not there is a need for a foreign partner.

    b. Is this company allowed to sell its products abroad independently?

One aspect that relates to the orientation of the company towards competitors is its distinguishing factor. This factor is what the company competes with, and what the company in Twente should comply with.

7. What is the competitive advantage of this company over other companies in the industry?
    a. Is this also a competitive advantage outside Russia? If not, how would the company like to distinguish itself in the foreign market?

The following questions give an insight into the innovativeness of the company.

8. Has the company ever developed a product or service that has become a standard in the industry, or not? If so, how many?

An example is the CD. Sony and Philips invented the CD, to which other companies had to adapt their products. Audio manufacturers did no longer make cassette recorders, but CD players. The invention of MP3 shows the same trend.

The following questions provide insight into the authority of the company in the industry. Furthermore, buying licences is connected to the absorptive capacity of the firm.

9. If any, how many patents are registered by this company?
10. If any, how many certificates does this company have?
11. If any, how many licences are bought from other companies per year?
12. In what countries are these patents, certificates and licences valid?
13. Does the production process of this company comply to international standards?
14. Do the products of this company comply to international standards?
15. Did this company ever publish presentations, articles or books, or not? If yes, how many?

The following questions are asked to learn more about whether or not foreign companies can access the information and technologies of this firm.

a. In what languages does the company publish?

16. Does the company participate in conferences and congresses, or not? If yes, are they international

The next question says something about the autonomy of the company.

17. Who makes the key decisions in this company?

At this point, LIST A should be given to the respondent. Tell him that you would like him to fill in this list and if there are any questions, that he can ask it.

LIST A:

This question is asked to know how to qualify the firm.

18. How would you define the strategy of the firm?

This firm aims to innovate, take risks, seek new opportunities and grow
The main concern of this firm is its stability
The firm aims to maintain its stability, but also aims to innovate
This firm aims to respond to environmental threats in an ad hoc fashion

This question tells us something about the market orientation of the company. Does it push to the market or does it pull from the market.

19. The philosophy of this company is to….

Sell goods and/or services
Solve problems of customers

The next questions identify the type of innovation, related to the orientation towards innovation.

20. What kind of innovation is preferred within the company?
    Improvements on existing products and services
    Development of new products and services

The next questions give a picture on the financial performance of the company and predictions for the future to say something about economic effectiveness of the company.

21. What is the return on investments of this company?

    0-25%
    26-50%
    51-75%
    76-100%

What return on investments do you think will be reached 5 years from now?

0-25%
26-50%
51-75%
76-100%

22. What were the total revenues of the company in 2006?

    Less than 25.000 euros
    25.000-100.000 euros
    100.000-500.000 euros
    500.000-1 million euros

What do you expect to be the total revenues of this company 5 years from now?

Less than 25.000 euros
25.000-100.000 euros
100.000-500.000 euros
500.000-1 million euros
no revenues will be made

23. How much profit did this company make in 2006?
    Less than 25.000 euros
    25.000-100.000 euros
    100.000-500.000 euros
    500.000-1 million euros
    no profit was made

How much profit do you think will be made 5 years from now?

Less than 25.000 euros
25.000-100.000 euros
100.000-500.000 euros
500.000-1 million euros
no profit will be made

The next questions indicate the market orientation of the company.

		Not al all						To an extreme Extent	I don't know/ not applicable
24.	We regularly share information within our business concerning competitor's strategies	1	2	3	4	5	6	7	0
25.	Our business objectives are driven primarily by customer satisfaction	1	2	3	4	5	6	7	0
26.	We rapidly respond to competitive actions that threaten us	1	2	3	4	5	6	7	0
27.	We constantly monitor our level of commitment and orientation to serving customer's needs	1	2	3	4	5	6	7	0
28.	Our strategy for competitive advantage is based on our understanding of customers' needs	1	2	3	4	5	6	7	0
29.	Our business strategies are driven by our beliefs about how we can create greater value for customers	1	2	3	4	5	6	7	0
30.	We measure customer satisfaction systematically and frequently	1	2	3	4	5	6	7	0
31.	We give close attention to after-sales service	1	2	3	4	5	6	7	0
32.	We regularly discuss competitors' strength and strategies	1	2	3	4	5	6	7	0
33.	We target our customers where we have an opportunity for competitive advantage	1	2	3	4	5	6	7	0

Now, a separate question on whether or not the respondent believes himself that the company is market oriented follows. There could be a difference between thinking and doing. Through first asking the previous questions, and now asking the following, is a way to validate.

34.	Our company is market oriented	1	2	3	4	5	6	7	0

To learn more about the authority of the company compared to others.

35.	Our patents, licences and certificates Are unique compared to those of other In the industry	1	2	3	4	5	6	7	0

After the respondent has filled out LIST A and handed it back, please scan the answers quickly to see if there are any strange things and if all questions are answered. If not all questions are answered, ask if he could still do it. If there are any strange things, please let him elaborate on his answer briefly.

Input

It is important to know what the inputs are for the company to perform its activities. Most of the following questions relate to the cultural capital of the company.

FTE = Full Time Employee. This is a general question, to put the rest in perspective. It says something about the size of the company.

36. How many FTEs does this company currently have?

This question provides insight into the education of the employees and entrepreneur.

37. What are the educational backgrounds of the people who work for this company?

The level of technical specialists within a firm indicates the level of innovation within a company. Thus, this question relates to orientation towards innovation, in turn relating to strategic capital.

38. How many technical specialists are working for this company?

This question indicates what skills are considered to be important in the company. This is a better way of learning about this than asking directly about the skills that are considered important. It is part of entrepreneurial skills as it belongs to human resource management.

39. What are the main criteria on which employees are hired to this company?

Answer indication: years of experience, belonging to a certain scientific field, etc.

These questions also indicate what skills and activities are considered valuable within the company

40. How many employees were hired based on their specific knowledge and skills? What were these knowledge and skills?

41. Does this company offer courses or trainings to its staff, or not? If yes, what courses and trainings?

42. Has anybody in the company received marketing training or education, or not?

43. Has anybody in the company received training or education in financial management, or not?

44. Has anybody in the company received training or education in international management, or not?

45. Does the company have experience in international business, or not? If yes, what kind of experience?

The next question provides insights into how the company could develop, or how the partner or MEPhI could help the company to develop necessary skills.

46. If any, what skills could be improved within this company?

Write down the answer, because it will be elaborated upon in the last section.

At this point, LIST B should be given to the respondent. Tell him that you would like him to fill in this list and if there are any questions, that he can ask it.

LIST B

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Don't know/ not applicable
To find out if the strategy of the company is supported throughout the entire company relates to cultural capital						
47. I agree with the current strategy of The company	1	2	3	4	5	0
To find out about the entrepreneurial orientation.						
48. My firm typically initiates actions which Competitors then respond to	1	2	3	4	5	0
49. My firm has been the first in the industry to introduce new products/services, administrative techniques, operating technologies, etc.	1	2	3	4	5	0
50. In general, this company has a strong Tendency to be ahead of others in Introducing novel ideas or products	1	2	3	4	5	0
51. In this company, there is a strong Emphasis on R&D, technological Leadership and innovations	1	2	3	4	5	0
52. In the past 5 years, very many new lines Of products/services have been marketed	1	2	3	4	5	0
53. We have experienced quite dramatic Changes in product or service lines	1	2	3	4	5	0
54. This company has a strong tendency for High-risk projects (with chances of High returns)	1	2	3	4	5	0
55. Owing to the nature of the environment, Bold, wide-ranging acts are necessary to Achieve the firms' objectives	1	2	3	4	5	0
56. When confronted with decisions involving Uncertainty, my firm adopts a bold posture In order to maximize the probability of Exploiting opportunities	1	2	3	4	5	0
57. My firm adopts a very competitive "undo-the-competition" posture	1	2	3	4	5	0
58. My firm is very aggressive and Intensely competitive	1	2	3	4	5	0

59. In this company, experimentation Is rewarded	1	2	3	4	5	0
60. In this company, taking initiative Is rewarded	1	2	3	4	5	0

Financial management and marketing management seem to be problem areas in High-tech start up firms. These questions can be asked to see if these companies also suffer from this problem. Previous open questions about skills in the company and educational backgrounds can validate the following questions.

61. This company is adequately skilled In financial management	1	2	3	4	5	0
62. This company is adequately skilled In marketing management	1	2	3	4	5	0
63. This company is adequately skilled To function in the international market	1	2	3	4	5	0

Previously, questions were asked about financial performance and efficiency. This question is to validate previous answers.

64. We use our means efficiently	1	2	3	4	5	0

The facilities of the company are related to its economic capital.

65. What facilities are used by the company?

Office space
Production space
Laboratory
Storage space
Shop/showroom
Cars
Other…..

To learn more about the funding of the company, and its financial resources, the following questions are asked. Questions about the future are also added to see what the division of funding is likely to do in the future. This is important to say something about the efficiency and dependence on other companies.

66. How much funding do you currently receive from MEPhI?	How much funding do you expect to receive from MEPhI in 5 years from now?
0-25%	0-25%
26-50%	26-50%
51-75%	51-75%
76-100%	76-100%

67. How much funding do you currently receive from external partners (including subsidies)? 0-25% 26-50% 51-75% 76-100%	How much funding do you expect to receive from external partners in 5 years from now (including subsidies)? 0-25% 26-50% 51-75% 76-100%
68.What is your own current contribution to the funding of the company? 0-25% 26-50% 51-75% 76-100%	How much do you expect to contribute yourself to the funding of the company in 5 years from now? 0-25% 26-50% 51-75% 76-100%

After the respondent has filled out LIST B and handed it back, please scan the answers quickly to see if there are any strange things and if all questions are answered. If not all questions are answered, ask if he could still do it. If there are any strange things, please let him elaborate on his answer briefly.

The following questions are also related to the economic efficiency of the company.

69. What does the company spend most money on?
70. If any, in what areas could costs be cut?

The next question is helpful for assessing the needs of the company that the partner or the entrepreneurial support system of MEPhI could fulfil.

71. Do you think the company has access to enough financial resources and facilities, or not? If not:
    a. What resources or facilities do you need that you do not have access to?

    Write down the answer, because it will be elaborated upon in the last section.

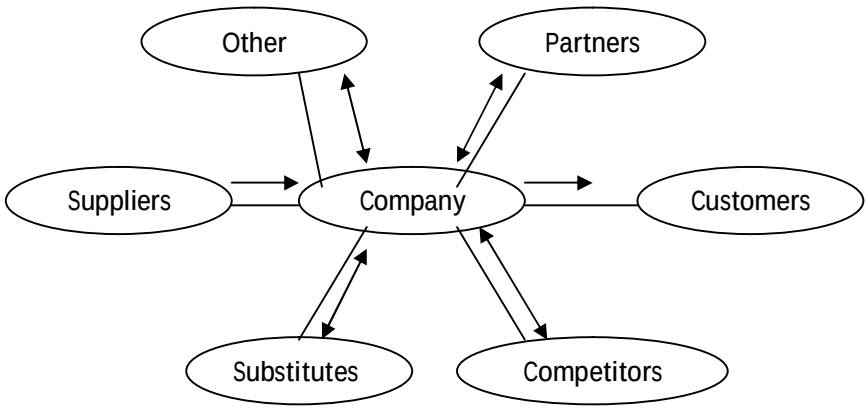
The following questions can only be asked to the owner of the company, as it would not make sense to ask them to employees. If you are not talking to the owner, please skip these questions. If you are talking to the owner, these questions provide insights into entrepreneurial experience.

72. Did you receive any education or courses in entrepreneurship, or not?
73. Did or do you have another company, or not?
74. Do you have any previous experience in the technical field of your company, or not?
75. Do you follow refreshment courses, or not? If yes, what courses and how often.

The network

Introduce the subject network to the respondent. These questions relate to the social capital of the company.

While asking questions about the network, a drawing can be made of it that will look similar as this:



Illustrate the direction of resource transfer with arrows.

First, general questions about the network will be asked.

76. How many customers do you have?
77. Who are your main customers?

The next question is important to know about the power that the customers have over the company.

78. How long do you expect to have a relationship with these customers?

Continue drawing the network

79. Who are your main suppliers?
80. Who are your main competitors?

To learn about orientation towards competitors, the next question is included.

81. Does the company collaborate with (some) competitors, or not? If yes, in what areas?

To know if there are already international components in the network of the company, next question is asked.

82. Does the company have any foreign partners, suppliers, customers, or not?

The next question is included to learn more about the close partners of the company. It is designed as follows because it is more convenient to learn more about one partner at the time, than to learn about the intensity with all contacts and then move to the next point of duration. When sticking to one actor, the interview will be more structured.

83. Who are your <u>main</u> partners and what are the benefits of these partners for the company?

Actor	Intensity (number of contacts per month)	Duration of a contact	Number of ties	Nature of ties (what resources are exchanged?)
1.				
2.				
3.				
4.				
5.				
…				

By now, the drawing of the network should be somewhat extensive. Involve the interviewee in the picture and ask more questions about what partners there are and about the direction of resource transfer. Also ask what indirect links there are. Lastly, try to find out how the other actors in the network are linked to each other.

The following questions indicate the current activities undertaken by the company to establish an international network.

84. What, if anything, does the company do to establish an international network?
    Answer indication: Publish in English, English website, participation in congresses, etc, make use of international network of others, etc.

85. How could a company in Twente know about this company?

The next question relates to economic efficiency. When a partner makes an investment, the company saves resources.

86. Was the company ever involved in joint projects where the partner made investments that this company did not have to make, or not? If yes, what were these investments made by other partners and how often does this happen?

The following questions indicate the influence of the company on its partners and the influence of the partners on the company. This is strategic capital.

87. Has this company ever adapted its strategy because this was better for another network partner, or not? If yes, what have you changed and why?

The next questions are asked to identify what the company can or is willing to add to the network. It is important to know what kind of resources will be shared with the potential partner.

88. What resources that you are not currently sharing, are you willing to share with your network?
    Answer indication: money, information, skills, power, etc.

89. What resources do you not want to share with your network?
Answer indication: money, information, skills, power, etc.

At this point, LIST C should be given to the respondent. Tell him that you would like him to fill in this list and if there are any questions, that he can ask it.

LIST C

The next question is asked to put the revenue from the main customers into perspective. This question is not relevant for suppliers.

90. What is the average size of your three main customers measured by their employees? (If applicable)
    a. One man only
    b. Very small (1-5 employees)
    c. Small (6-50 employees)
    d. Medium (51-100 employees)
    e. Big (101-250 employees)
    f. Very big (251 and more employees)

The following questions are asked to learn about the influence of the customers to the company and the influence of the company to the supplier, so, strategic capital.

91. What percentage of revenues revenue do your three main customers generate for this company?
    … %

92. What percentage of revenues do you generate for your three main suppliers?
    … %

The next question is meant to define what partner in Twente could be looked for.

93. What kind of partner are you looking for?
    a. A reseller
    b. A partner for product development
    c. A partner for joint research
    d. Other, namely….

94. What size do you want the partner to be, regarding revenues?
    Of similar size than this company
    Of smaller size than this company
    Of bigger size than this company
    It does not matter

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Don't know/ not applicable
The next questions indicate the influence of the company on others and the influence of others on the company.						
95. In formulating our strategy, we take The goals of our partners into account	1	2	3	4	5	0
96. We are able to persuade other parties In our network to do something for us	1	2	3	4	5	0
97. Other parties in this industry stay Informed about our activities	1	2	3	4	5	0
98. Our network partners consider us Very important	1	2	3	4	5	0
99. It is important to have an international Network	1	2	3	4	5	0
From the exchange of resources we can see what value is added to the company. This question is asked to validate whether or not the respondent also perceives it that way.						
100. The current network of the company Is very valuable to the company	1	2	3	4	5	0

After the respondent has filled out LIST C and handed it back, please scan the answers quickly to see if there are any strange things and if all questions are answered. If not all questions are answered, ask if he could still do it. If there are any strange things, please let him elaborate on his answer briefly.

The future

The next questions are helpful to identify where the company wants to go in the future. Also, questions are asked about what problems are foreseen. Of course, this is not totally predictable, but it could be that the companies already know about several aspects so that they can anticipate. Also, if they already know they cannot handle certain problems themselves, the entrepreneurial support structure and/or the partner in Twente could help the company overcome these problems.

101. How many FTEs does this company expect to have 5 years from now?

The following question was asked: "What are the short-term and long-terms goals of the company and does the firm have any goals in foreign markets?" Repeat the answer.

102. Do you foresee any problems in attaining these goals, or not? If yes, what problems do you foresee?
Write down the answer, because it will be elaborated upon in the last section.

103. In what way, if any, does the company like to distinguish itself more from its competitors?
    a. Do you foresee any problems in distinguishing the company from its competitors in this way, or not? If yes, what problems do you foresee?
Write down the answer, because it will be elaborated upon in the last section.

This is a rather broad question to ask what the company could use from a partner to make the network more valuable to the company. This could be used in searching for this partner.

104. In what way could a network become more valuable to your company?
Write down the answer, because it will be elaborated upon in the last section.

Role of partner/MEPhI

These last questions are broad and are asked to learn about the wishes of the company concerning the entrepreneurial support from MEPhI and regarding a potential partner. These questions provide the possibility for the respondent to introduce issues that were not previously mentioned and that fall beyond the scope of the 4S model. The answers could maybe surprise us.

105. In what way is this company supported by MEPhI?
This could be financial support, courses, trainings, facilities, etc.

a. In what way does MEPhI help the company to establish an international network?
Answer indication: introduction to the international network of MEPhI, participation in international congresses, no support, etc.

b. What, if anything, should MEPhI do to help you become more internationalized?

106. What does MEPhI offer this company that the company cannot provide for itself?

107. Are you satisfied with the support that this company receives from MEPhI? If yes, what is so good about it? If not, what could be improved?

The following question was asked: "What are the short-term and long-terms goals of the company and does the firm have any goals in foreign markets?" Then, the following question was asked: "Do you foresee any problems in attaining these goals, or not? If yes, what problems do you foresee?" Repeat the answer.

108. How can MEPhI or a partner help the company achieve its goals?

The following question was asked: "In what way, if any, does the company like to distinguish itself more from its competitors? Do you foresee any problems in distinguishing the company from its competitors in this way, or not? If yes, what problems do you foresee?" Repeat the answer and keep the distinguishing factor on the international market in mind.

109. What do you need from MEPhI or a partner to help the company distinguish itself?

The following question was asked: "If any, what skills could be improved within this company?" Repeat the answer.

110. What role can MEPhI or a partner play in improving these skills in your company?

The following question was asked: "Do you think the company has access to enough financial resources and facilities, or not? If not: What resources or facilities do you need that you do not have access to?" Repeat the answer.

111. In what way could MEPhI or a partner help you to obtain these resources?

The following question was asked: "In what way could a network become more valuable to your company?" Repeat the answer.

112. What specifically should a partner or MEPhI do to add value to the network?
113. What should a partner offer this company?
114. What are the prerequisites for a company to become a partner?
115. What, if anything, should a partner have in common with this company?
116. What does this company have to offer a partner?

Appendix 3b: Scheme Interview Questions for Technopark firms

General		1	2	6b												
Scope																
General		3	4													
International orientation		5	6a	7a	12	13	14	15a	16							
Orientation towards Innovation		18	20													
Market Orientation		6	7	19	24	25	26	27	28	29	30	31	32	33	34	103
Orientation towards Partners		95														
Power		8	9	10	35	90	91	92	96							
Reputation		11	15	16	97											
Flexibility		87														
Scale																
Financial resources		36	65	66	67	68	71	101								
Financial performance		21	22	23												
Operations of company		64	69	70	86											
Skills & values																
Technical Skills		37	38	40	41	74	75									
Entrepreneurial skills	marketing	37	40	41	42	62	75									
	Bus. Adm. & org.	37	40	41	72	73	75									
	financial management	37	40	41	43	61	75									
	HRM	37	39	40	41	75										
Entrepreneurial orientation	innovativeness	51	52	53												
	risk taking	54	55	56												
	proactiveness	48	49	50												
	competitive agressiveness	57	58	59	60											
International Orientation		44	45	63												
Social																
General		76	77	79	80	81										
Perceived importance network		88	89	99	100											
Positional aspects		83														
Relational aspects		78	83													
Internationalization		82	83	84	85	99										
Perception		93	94	99	113	114	115	116								
Received support		105	106	107												
Recommendations																
Strategic		103a	107	108	109											
Economic		107	111													
Cultural		46	107	110												
Social Network		104	107	112												

Appendix 4a: Twente Interview

TWENTE INTERVIEW

The company

1.Could you briefly describe the activities of the company?

2. Could you briefly describe your function within the company?

3. What are the short-term and long term goals of the company?

4. Does the company have any goals in the foreign market, or not? If yes, what are these goals?

5. What market segment is the company targeting at?
   If any, what foreign market segment is the company targeting at?
   Is this company allowed to sell its products abroad independently?

6. What is the competitive advantage of this company over other companies in the industry?

7. Would you say that your firm is strategically competent?

8. Has the company ever developed a product or service that has become a standard in the industry, or not? If so, how many?

9. If any, how many patents are registered by this company?

10. If any, how many certificates does this company have?

11. If any, how many licences are bought from other companies per year?

12. In what countries are these patents, certificates and licences valid?
    Do you know how to apply for international patents?
    Do you think you can help the firm at Technopark to apply for international patents?

13. Does the production process of this company comply to international standards?

14. Do the products of this company comply to international standards?

15. Did this company ever publish presentations, articles or books, or not? If yes, how many?
    In what languages does the company publish?

16. Does the company participate in conferences and congresses, or not? If yes, are they international

LIST A QUESTIONS

Input

35. How many FTEs does this company currently have?

36. How many FTEs do you expect to have in 5 years from now?

37. What are the educational backgrounds of the people who work for this company?

38. How many technical specialists are working for this company?

39. Does this company offer courses or trainings to its staff, or not? If yes, what courses and trainings?

40. Has anybody in the company received marketing training or education, or not?

41. Do you think that you are able to take over marketing activities of the firm at Technopark?

    a. Are you willing to do this?

42. Has anybody in the company received training or education in financial management, or not?

43. Do you think that you are able to take over financial management activities of the firm at Technopark?

    a. Are you willing to do this?

44. Has anybody in the company received training or education in international management, or not?

45. Does the company have experience in international business, or not? If yes, what kind of experience?

    a. Do you have any experience in Russia?

46. If any, what skills could be improved within this company?

LIST B QUESTIONS

68. What does the company spend most money on?

69. If any, in what areas could costs be cut?

70. Do you think the company has access to enough financial resources and facilities, or not? If not:
    a. What resources or facilities do you need that you do not have access to?

71. Did you receive any education or courses in entrepreneurship, or not?

72. Did or do you have another company, or not?

73. Do you have any previous experience in the technical field of your company, or not?

74. Do you follow refreshment courses, or not? If yes, what courses and how often

The network

75. How many customers do you have?

76. Who are your main customers?

77. How long do you expect to have a relationship with these customers?

78. Who are your main suppliers?

79. Who are your main competitors?

80. Does the company collaborate with (some) competitors, or not? If yes, in what areas?

81. Does the company have any foreign partners, suppliers, customers, or not?

82. Who are your main partners and what are the benefits of these partners for the company?

Actor	Intensity (number of contacts per month)	Duration of a contact	Number of ties	Nature of ties (what resources are exchanged?)
1.				
2.				
3.				
4.				
5.				
…				

83. Do you have any investors in your network?
    a. Would this investor be interested in investing in the firm in Moscow?

84. What, if anything, does the company do to establish an international network?

85. How could a company in Moscow know about this company?

86. Was the company ever involved in joint projects where the partner made investments that this company did not have to make, or not? If yes, what were these investments made by other partners and how often does this happen?

87. Has this company ever adapted its strategy because this was better for another network partner, or not? If yes, what have you changed and why?

88. What resources are you willing to share with the firm at Technopark?

89. What resources do you not want to share with the firm at Technopark?

LIST C QUESTIONS

Partner

101. What are your expectation from a partnership with the firm at Technopark?
   a. What do you want to gain?
   b. What do you not want from the relationship?
   c. In what way is Russia interesting for you?

102. Are you interested in being a reseller (or …) for this firm at Technopark?

103. The goals of the firm are to (….) Do you think that the goals of this company are compatible to those of the firm at Technopark?

104. What do you have to offer the firm at Technopark?

   a. Can you provide the partner with …? (every interview different, depends on what was requested for by the firm)

105. Would you invest in the company at Technopark?
   a. Why (not)?

106. What contacts that you have could also be valuable to the firm at Technopark?

107. What should a partner offer this company?

108. Is a relationship still valuable for you if the partner does not want to share …? (every interview different, eg. IP)

109. What kind of contacts with third parties would you like to gain from a partnership with a firm at Technopark?

110. Would you prefer a short or long term collaboration?

111. Are you willing to have an ad hoc based relationship with the company of Technopark?

112. What are the prerequisites for a company to become a partner?

113. What, if anything, should a partner have in common with this company?

LIST A:

17. How would you define the strategy of the firm?

This firm aims to innovate, take risks, seek new opportunities and grow
The main concern of this firm is its stability
The firm aims to maintain its stability, but also aims to innovate
This firm aims to respond to environmental threats in an ad hoc fashion

18. The philosophy of this company is to….
Sell goods and/or services
Solve problems of customers

19. What kind of innovation is preferred within the company?
Improvements on existing products and services
Development of new products and services

20. What is the return on investments of this company?

0-25%
26-50%
51-75%
76-100%

What return on investments do you think will be reached 5 years from now?

0-25%
26-50%
51-75%
76-100%

22. How much profit did this company make in 2006?

Less than 25.000 euros
25.000-100.000 euros
100.000-500.000 euros
500.000-1 million euros
no profit was made

What do you expect to be the total revenues of this company 5 years from now?

Less than 25.000 euros
25.000-100.000 euros
100.000-500.000 euros
500.000-1 million euros
no revenues will be made

21. What were the total revenues of the company in 2006?

Less than 25.000 euros
25.000-100.000 euros
100.000-500.000 euros
500.000-1 million euros
no revenues were made

How much profit do you think will be made 5 years from now?

Less than 25.000 euros
25.000-100.000 euros
100.000-500.000 euros
500.000-1 million euros
no profit will be made

		Not al all						To an extreme Extent	I don't know/ not applicable
23.	We regularly share information within our business concerning competitor's strategies	1	2	3	4	5	6	7	0
24.	Our business objectives are driven primarily by customer satisfaction	1	2	3	4	5	6	7	0
25.	We rapidly respond to competitive actions that threaten us	1	2	3	4	5	6	7	0
26.	We constantly monitor our level of commitment and orientation to serving customer's needs	1	2	3	4	5	6	7	0
27.	Our strategy for competitive advantage is based on our understanding of customers' needs	1	2	3	4	5	6	7	
28.	Our business strategies are driven by our beliefs about how we can create greater value for customers	1	2	3	4	5	6	7	0
29.	We measure customer satisfaction systematically and frequently	1	2	3	4	5	6	7	0
30.	We give close attention to after-sales service	1	2	3	4	5	6	7	0
31.	We regularly discuss competitors' strength and strategies	1	2	3	4	5	6	7	0
32.	We target our customers where we have an opportunity for competitive advantage	1	2	3	4	5	6	7	0
33.	Our company is market oriented	1	2	3	4	5	6	7	0
34.	Our patents, licences and certificates Are unique compared to those of others In the industry	1	2	3	4	5	6	7	0

LIST B

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Don't know/ not applicable
47. My firm typically initiates actions which Competitors then respond to	1	2	3	4	5	0
48. My firm has been the first in the industry to introduce new products/services, administrative techniques, operating technologies, etc.	1	2	3	4	5	0
49. In general, this company has a strong Tendency to be ahead of others in Introducing novel ideas or products	1	2	3	4	5	0
50. In this company, there is a strong Emphasis on R&D, technological Leadership and innovations	1	2	3	4	5	0
51. In the past 5 years, very many new lines Of products/services have been marketed	1	2	3	4	5	0
52. We have experienced quite dramatic Changes in product or service lines	1	2	3	4	5	0
53. This company has a strong tendency for High-risk projects (with chances of High returns)	1	2	3	4	5	0
54. Owing to the nature of the environment, Bold, wide-ranging acts are necessary to Achieve the firms' objectives	1	2	3	4	5	0
55. When confronted with decisions involving Uncertainty, my firm adopts a bold posture In order to maximize the probability of Exploiting opportunities	1	2	3	4	5	0
56. My firm adopts a very competitive "undo-the-competition" posture	1	2	3	4	5	0
57. My firm is very aggressive and Intensely competitive	1	2	3	4	5	0
58. In this company, experimentation Is rewarded	1	2	3	4	5	0

59. In this company, taking initiative Is rewarded	1	2	3	4	5	0
60. This company is adequately skilled In financial management	1	2	3	4	5	0
61. This company is adequately skilled In marketing management	1	2	3	4	5	0
62. This company is adequately skilled To function in the international market	1	2	3	4	5	0
63. We use our means efficiently	1	2	3	4	5	0

64. What facilities are used by the company?

Office space
Production space
Laboratory
Storage space
Shop/showroom
Cars
Other.....

65. How much funding do you currently receive from UT? 0-25% 26-50% 51-75% 76-100%	How much funding do you expect to receive from UT in 5 years from now? 0-25% 26-50% 51-75% 76-100%
66. How much funding do you currently receive from external partners (including subsidies)? 0-25% 26-50% 51-75% 76-100%	How much funding do you expect to receive from external partners in 5 years from now (including subsidies)? 0-25% 26-50% 51-75% 76-100%
67.What is your own current contribution to the funding of the company? 0-25% 26-50% 51-75% 76-100%	How much do you expect to contribute yourself to the funding of the company in 5 years from now? 0-25% 26-50% 51-75% 76-100%

LIST C

90. What is the average size of your three main customers measured by their employees? (If applicable)
    - One man only
    - Very small (1-5 employees)
    - Small (6-50 employees)
    - Medium (51-100 employees)
    - Big (101-250 employees)
    - Very big (251 and more employees)

91. What percentage of revenues revenue do your three main customers generate for this company?
    ... %

92. What percentage of revenues do you generate for your three main suppliers?
    ... %

93. What kind of partner could you be?
    - A reseller
    - A partner for product development
    - A partner for joint research
    - Other, namely....

94. What size do you want the partner to be, regarding revenues?
    - Of similar size than this company
    - Of smaller size than this company
    - Of bigger size than this company
    - It does not matter

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Don't know/ not applicable
95. In formulating our strategy, we take The goals of our partners into account	1	2	3	4	5	0
96. We are able to persuade other parties In our network to do something for us	1	2	3	4	5	0
97. Other parties in this industry stay Informed about our activities	1	2	3	4	5	0
98. Our network partners consider us Very important	1	2	3	4	5	0
99. It is important to have an international Network	1	2	3	4	5	0
100. The current network of the company Is very valuable to the company	1	2	3	4	5	0

Appendix 4b: Scheme interview questions for UT firms

General		1	2	5b											
Scope															
General		3	7												
International orientation		4	12	13	14	15a	16								
Orientation towards Innovation		17	19	38											
Market Orientation		5	6	18	23	24	25	26	27	28	29	30	31	32	33
Orientation towards Partners		95													
Power		8	9	10	34	90	91	92	96						
Reputation		11	15	16	97										
Flexibility		87													
Scale															
Financial resources		35	36	64	65	66	67	70							
Financial performance		20	21	22											
Operations of company		63	68	69	86										
Skills & values															
Technical Skills		37	38	39	46	73	74								
Entrepreneurial skills	marketing	37	39	40	46	61	74								
	Bus. Adm. & org.	37	39	46	71	72	74								
	financial management	37	39	42	46	60	74								
Entrepreneurial orientation	innovativeness	50	51	52											
	risk taking	53	54	55											
	proactiveness	47	48	49											
	competitive agressiveness	56	57	58	59										
International Orientation		12a	44	45	62										
Social															
General		75	76	78	79	80	83								
Perceived importance network		82	88	89	98	99	100								
Positional aspects		82													
Relational aspects		77	82												
Internationalization		81	82	84	99										
Perception		93	94	101	102	103	107	108	109	110	111	112	113		
Support to be offered		12b	41	43	83a	104	105	106							

Appendix 5a: Interview MEPhI support structure

Interview Support Structure

General

1. Could you briefly describe the main activities of this department?
2. Could you briefly describe your function within this department?

3. What is the added value of this department to the firms of TechnoPark?

The department

4. What are the main goals of this department?

5. Who are you targeting at?

6. What, if any, external parties does this department have to take into account when making important decisions? (other departments, firms, other external parties)

7. What educational specializations are represented within this department?

8. Has anybody in this department received education or training in
    a. marketing management?
    b. financial management?
    c. Business?
    d. International business?

9. Does anybody in this department follow refreshment courses? If yes, how often and which are they?

10. In what areas can skills be improved within this department?

11. How many FTEs are there in this department?

12. What facilities do you use?

13. What are the financial goals of this department? *(Make a profit, non-profit org.,)*

14. How is this department financed?

15. Does this department have access to enough financial resources, or not?
    a. If not, what resources does this department need?

16. With whom does this department cooperate *(other departments, faculties, other external parties, international parties)*

17. Who are your main partners
    a. How often per month do you have contact with them?
    b. How long does one contact take?
    c. What resources are exchanged with this partner?
18. Do you have financial investors within your network?
    a. If yes, how strong are these contacts?

19. Could you draw your network?

20. If any, what kind of partner with what kind of resources do you need to add value to this department?

21. Do you have any international experience? If yes, what experience?

Support to firms at TechnoPark

From idea to strategy

22. If at all, how do you help firms
    a. to generate ideas for business development?
    b. To convert these ideas into a business plan?
    c. To exploit the ideas in order to benefit from it?

23. What are the kind of goals that you promote firms to follow? *(profit, output, market share, intrinsic motivations, etc).*
    a. What, in your experience, are the kind of goals that the firms often follow?

24. In what way, if at all, do you help firms to establish goals in the international market?

25. How, if at all, do you help firms to identify their customers?

26. In what way, if at all, do you help firms to become more adaptive to the needs of their customers?

27. How, if at all, do you help firms to identify their competitors?

28. How do you help firms to become more adaptive to the activities of competitors?

29. Do you help firms to identify their *foreign* customers and competitors, or not?

30. Should firms adapt their strategies towards the needs of their partners, or not?
    i. In what way do you promote this view to the firms of TechnoPark?

31. In what way, if any, do you help firms to determine their advantage over other companies in the industry?

32. What philosophy do you promote to the firms at TechnoPark
    a. To sell goods and/or services
    b. To solve problems of customers
    c. Both philosophies are promoted equally
    d. We do not promote any philosophy
        i. How is this philosophy stimulated?

33. In what way, if at all, do you assist firms to comply their products and production processes to international standards?

Economic and Financial means

34. Do you provide facilities for spin-off companies, or not?
    a. If yes, what facilities do you provide?
        i. office space
        ii. production space
        iii. laboratories
        iv. storage space
        v. shop/showroom
        vi. cars

vii. equipment
viii. other, namely…

b. Are these facilities shared among companies at TechnoPark? (also canteens and coffee machines)
c. Is there a database of facilities, or not?
d. How are these facilities financed?

35. If any, what kind of financial relation is there between the department and the firms?

36. Do you offer subsidies to the firms, or not?
    a. If yes, what form of subsidy is this?
    b. In what cases can the firm receive this subsidy?

37. For what, if anything, do you receive money from the firms at TechnoPark?

38. Do you have equity in firms of TechnoPark?

39. In what way, if any, do you help firms to optimize their financial performance?

40. In what way, if any, do you offer advice on how to use the means of the company efficiently?

41. In what way, if at all, do you help firms to enhance skills in financial management?

42. How, if at all, do you help to find investors for the firms?
    a. What investors are found?
        i. business angels
        ii. informal investors
        iii. venture capitalists
        iv. other, namely

Patterns of Organization

43. In what way, if at all, do you help firms to enhance their technical skills?
    a. What technical skills are enhanced?

44. In what way, if at all, do you help firms to enhance marketing skills?

45. In what way, if at all, do you help firms with organizational aspects of their company?

46. In what way, if at all, do you help firms in their policies towards employees?

47. In what way, if at all, do you help firms to access knowledge from other firms in an informal manner?

48. If at all, how do you facilitate that firms share their knowledge amongst each other?

49. In what way, if at all, do you stimulate firms to become more innovative?

50. How, if applicable, do you promote taking risks?

51. How, if at all, do you influence firms to stay ahead of others in their industries?

52. In what way, if at all, do you stimulate firms to challenge their competitors?

Network contacts

53. How, if at all, do you help firms to establish contacts with other (international) firms?

54. What, if any, efforts do you make to connect entrepreneurs with other entrepreneurs, within or outside TechnoPark?

55. Do you organize exhibitions or conferences?
    a. If yes, are they international?

56. How, if at all, do you promote participation in conferences and congresses?
    a. Do you promote participation in international conferences and congresses?

57. What do you think is the added value of a network to a firm?

58. In what way, if at all, do you help firms to become more important within their network?

59. In what way, if at all, do you guide firms to establish strong relations with their others in their network?

Internationalization

60. Do you think that the companies at TechnoPark are sufficiently internationalized, or not? Why?

61. How do you promote firms to internationalize?

62. If at all, how do you help firms to obtain international experiences?
    a. What kind of experiences are these?

63. In what way, if any, do you help firms to enhance foreign language skills?
    a. What languages are they?

64. If at all, how do you promote the products of the firms abroad?

65. Do you think that TechnoPark offers enough support to help companies internationalize, or not?
    a. Why is the support enough or not enough for companies to internationalize?
66. How, if at all, could the companies at TechnoPark be supported more to internationalize their activities?

Other support activities

Mentorship

67. Do you offer guidance to the firms at TechnoPark in the form of a mentor, or not? If yes, in what way?

68. Who are these mentors?

69. Where do you find these mentors?

70. What kind of advice and experience do these mentors offer the firms?

71. In what other way do these mentors add value to the firms?
    a. Does the mentor help the firm to create a business plan?
    b. Enhance (international) network?
    c. Obtain financial resources?
    d. Enhance skills?

72. What are the specializations of the mentors?

73. Can the firms turn to the mentor with their daily hassles, or not?

74. How are mentors and entrepreneurs of TechnoPark linked to each other?
    a. What role does personal bonding play in matching mentors with entrepreneurs?

75. Is there a description available on the activities of the mentor, or not?
    a. Does this include the expected function of the mentor for the entrepreneur, or not?

76. Is the mentor paid for his help, or not?
    a. Who pays for the help of the mentor?

Training and counseling

77. Do you offer training and counseling to the firms at TechnoPark, or not?
    a. In what field is the training or counseling provided?
    b. What kind of training is this?

78. Does the training and counseling offered follow the needs of the firms, or not?
    a. If yes, what are these needs?
    b. How do you know what the needs are?

Monitoring

79. Do you evaluate firm performance, or not? If yes, how do you evaluate firm performance?

80. Do you determine and plan meetings to monitor and discuss progress of the firms, or not?
    a. Are goals set for these meetings, or not?
    b. What subjects are included in these meetings?
        i. Are marketing and sales included as subjects, or not?

Wrap up

81. Is the support you provide equally accessible to all the firms at TechnoPark?
    a. If not, what differences are there?

82. Are there any other things that you do to support the firm that were not previously mentioned?

83. What could be done to help firms more to attain their goals?

84. How could you help firms more to operate efficiently

85. What could be done to help firms to improve their skills?

86. How could you help firms to enhance their international network?

87. How could TechnoPark or MEPhI add more value to the firms at TechnoPark?

88. Do you have anything to add?

Written questions
The department

89. The firms at TechnoPark consider us very important

90. The firms at TechnoPark always try to put our advice into practice

91. Our department is adequately skilled in technology

92. Our department is adequately skilled in marketing management

93. Our department is adequately skilled in financial management

94. Our department is adequately skilled in international business management

95. This department has very clear HRM policy

96. This department investigates needs of the firms	1	2	3	4	5	0
97. The goals of this department are adapted to the needs of the firms	1	2	3	4	5	0
98. Enhancing technical skills of the firms is very important within this department	1	2	3	4	5	0
99. Enhancing financial management skills of the firms is considered very important within this department	1	2	3	4	5	0
100. Enhancing marketing skills of the firms is very important within this department	1	2	3	4	5	0
101. Enhancing organizational skills of the firms is very important within this department	1	2	3	4	5	0
102. Enhancing HRM skills is very important within this department	1	2	3	4	5	0
103. We measure satisfaction of the firms systematically andfrequently	1	2	3	4	5	0

Strongly disagree		Neutral		Strongly agree	Don't know/ Not applicable
1	2	3	4	5	0
1	2	3	4	5	0
1	2	3	4	5	0
1	2	3	4	5	0
1	2	3	4	5	0
1	2	3	4	5	0
1	2	3	4	5	0

<u>Support to firms at TechnoPark</u>

From Idea to Strategy

104. We help firms to apply for patents

105. We help firms to apply for international patents

106. We help firms to obtain licenses

107. We help firms to obtain foreign licenses

108. We help firms to obtain certificates

109. There is an inventory available of possibilities for entrepreneurs to obtain a patent or a license

110. Obtaining, usage and conditions of patents or licenses of the firms at TechoPark is documented

111. A list of research at the University is available

Yes No Don't know/not applicable

112. There is a list of available university experts

Yes No Don't know/not applicable

	Strongly disagree		Neutral		Strongly agree	Don't know/ Not applicable
113. We stimulate firms to publish presentations, articles or books	1	2	3	4	5	0
114. We stimulate firms to publish presentations, articles or books in foreign languages	1	2	3	4	5	0

Economic and financial means

115. We stay informed about the financial performance of the firms at TechnoPark	1	2	3	4	5	0

116. The financial relation between the department and the firms is documented

Yes No Don't know/not applicable

117. The value of the firms at TechnoPark is determined

Yes No Don't know/not applicable

118. The financial needs of firms are included in their business plans

119. We offer advice on subsidy opportunities

Yes No Don't know/not applicable

120. A database on business angels, investors and venture capitalists is available

Yes No Don't know/not applicable

Patterns of organization

Yes No Don't know/not applicable

121. The firms at TechnoPark are adequately skilled in their technical field of operations

Yes No Don't know/not applicable

122. It is very important that firms at TechnoPark are adequately skilled in their technical field of operations

Yes No Don't know/not applicable

123. The firms at TechnoPark are adequately skilled in marketing management

Yes No Don't know/not applicable

124. It is very important that firms at TechnoPark are adequately skilled in marketing management

125. The firms at TechnoPark are adequately skilled in financial managmement	1	2	3	4	5	0
126. It is very important that firms at TechnoPark are adequately skilled in financial management	1	2	3	4	5	0
127. The firms at TechnoPark are adequately skilled in HRM	1	2	3	4	5	0
128. It is very important that firms at TechnoPark are adequately skilled in HRM	1	2	3	4	5	0
129. Firms at TechnoPark are adequately skilled to function on the international market	1	2	3	4	5	0
130. It is very important that firms at TechnoPark are adequately skilled to function on the international market	1	2	3	4	5	0

Yes	No	Don't know/not applicable	131. The firms at TechnoPark should be innovative
Yes	No	Don't know/not applicable	132. The firms at TechnoPark should dare to take risks
Yes	No	Don't know/not applicable	133. The firms at TechnoPark should stay ahead of other companies in similar industries
			134. The firms at TechnoPark should actively challenge competitors to improve their position in the market

Strongly disagree		Neutral	Strongly agree		Don't know/ Not applicable	
1	2	3	4	5	0	Network contacts
1	2	3	4	5	0	135. We regularly organize meetings with all entrepreneurs connected with this department
1	2	3	4	5	0	136. We assist in finding customers
1	2	3	4	5	0	137. We assist in finding international customers
1	2	3	4	5	0	138. We assist in finding suppliers

139. We assist in finding international suppliers

Yes No Don't know/not applicable

140. We assist in finding partners

Yes No Don't know/not applicable

141. We assist in finding international partners

Yes No Don't know/not applicable

142. Networks are very important to the operations of the firms at TechnoPark

143. *International* networks are very important for the functioning of the firms at TechnoPark

Strongly disagree		Neutral	Strongly agree		Don't know/ Not applicable
1	2	3	4	5	0
1	2	3	4	5	0

Other support activities

Mentorship

144. A database of mentors is available

Yes No Don't know/not applicable

145. A list of criteria for mentors is available

Yes No Don't know/not applicable

Strongly disagree		Neutral	Strongly agree		Don't know/ Not applicable
1	2	3	4	5	0
1	2	3	4	5	0

146. Documented agreements between mentor and entrepreneur exist

Yes No Don't know/not applicable

Monitoring

147. A person or team is especially assigned to carry out monitoring activities of development and progress of the firms at TechnoPark

Yes No Don't know/not applicable

Training and counseling

148. We provide *training* in (multiple answers possible)

- Technology
- Marketing management
- Financial management
- Business & Organization
- International business
- Specific subjects related with the creation of the business plan
- Foreign languages

149. We provide *advice* in (multiple answers possible)

- Technology

Marketing management
Financial management
Business & Organization
International business
Specific subjects related with the creation of the business plan
Foreign languages
Training possibilities (inside or outside TechnoPark)

Yes No | Don't know/not applicable

Yes No | Don't know/not applicable

150. Do you help firms to establish

Short-term goals
Long-term goals
Both short-term and long-term goals
We do not help firms to establish goals

151. What kind of innovation do you stimulate?

development of existing products or services
new product or service development?
Both
Neither

152. What access to money does the department have?

The department has its own funds
The department obtains funds from other investors
The department has its own funds *and* obtains funds from other investors
The department has no access to money

Appendix 5b: Scheme interview questions entrepreneurial support structure MEPhI

Availability of finance for spin-off		116	35	37				
Assessing need through business plan		118						
Access to finance		36	42					
Database on investors		120						
Determine value of the company		117						
Subsidy management advice and support		119						

Supported dimensions								
Scope		22	23	150				
International orientation		24	29	33	105	107	114	

Orientation towards innovation		151						
Market orientation		25	26	27	28	29	31	32
Orientation towards partners		30						
Power		104	105	106	107	108		
Reputation		64	113	114				
Flexibility		30						
Scale								
Financial resources		36						
Financial performance		39						
Operations of the company		40						
Skills & Values								
Technical skills		43	89	121	122			
Entrepreneurial skills	Marketing	44	100	123	124			
	Bus. Adm. & Org.	45	101					
	Financial management	41	99	125	126			
	HRM	46	102	127	128			
Entrepreneurial orientation	Innovativeness	49	130					
	Risk taking	50	132					
	Proactiveness	51	133					
	Competitive agressiveness	52	134					
International orientation		62	63	129	130			
Social network								
General		136	137	138	139	140	141	
Positional aspects		53	54					
Relational aspects		58	59					
Internationalization		60	61	65	137	139	141	143
Percieved importance		57	142	143				

Appendix 6: Necessary, preferable or good idea to facilitate support activities

Mentorship
Necessary:
Description including the expected function of the mentor for the entrepreneur
List of criteria for mentors
Preferable:
Database of mentors
Documented agreement between mentor and entrepreneur
Training and counseling
Necessary:
-
Preferable:

Technical training and counseling
Periodical training in specific subjects connected to the business plan
Advice on training possibilities
Advice on marketing
Knowlegde: Intellectual Property
Necessary:
Informal access to knowledge
Documentation of all formal obtaining of patents and knowledge
Good idea:
Inventory of possibilities for entrepreneurs to obtain a patent or non-exclusive license
List/database of research at the university
List of available university experts
Monitoring
Necessary:
Setting short term objectives for meetings
Determine and plan monitoring meetings
Determine monitoring person or team
Networking
Necessary:
-
Preferable:
Networking
Facilities for a spin-off company
Necessary:
-
Preferable:
Database of facilities
Facility sharing
Availability of finance for spin-off companies
Necessary:
Assessing the needs for finances through a financial plan included in the business plan
Preferable:
Direct/indirect access to finance/money
Good idea:
Database on business angels, investors, venture capitalists
Determine value of the company
Subsidy management advice and support for acquisition for spin-off company

Appendix 7: Factsheet

Firm	Activities	Goals	International goals	Market segment	Competitive advantage
Aleksandr+	Offers services to medical clinics; advertising, purchasing of equipment and cosmetic medical preparations, repair of equipment, promotion of	Organize and manufacture equipment and materials. Receive necessary documentation. Organize a system of remote	None	Private entrepreneurs, not official bodies	Qualitative services

	equipment, technical and financial administration.	consultation. Create a network of centers across Russia.			
Aquaservice	research, development and implementation of innovative technologies of separation and purification of liquid and gaseous blends.	Win grants. Further development of research, development and implementation of innovative technologies of separation and purification of liquid and gaseous blends.	None. Non-commercial organization	Other research institutes	Unique technology
Eniko TSO	Development of trainer-simulators for preparing NPP personnel and tools for developing such trainer-simulators.	To finish development of fully prepared trainer-simulators for a digital control based on a VVER-1000 reactor. To consolidate the market.	None	Nuclear Power Plants	Effectiveness
Eskiz-MEPhI	Waterpurification. Household filters and extra-productive systems for collective and industrial purposes based on 'Geyger' filters.	To survive. Develop water purification systems with higher technology and performance features. Improve qualifications and skills of personnel. General advertising campaign. Active participation in exhibitions. Gain ten times volume increase in order. Develop a dealer network to trade in bulk 80% of production. Widening scope and quality of services. Minimizing production costs.	Master the market in East and Southeast Asia.	Apartments, houses, offices, kindergartens, schools, hospitals, food industry, hotels, restaurants, etc.	Long-term capability Simple mode for ordinary users Productivity Low price Technology
Lekis	Development of	Realize liabilities	Create strong	Science and	Uniqueness

	complex devices and development of methods for ecology, physics and chemistry, microbiology, medicine and cosmetics, and lasertechniques.	of clients. Push ideas towards mass production. Make profit from ideas.	partnerships with foreign companies.	new technology	
Lidasa	Water purification with use of solar energy	To survive.	Operates solely internationally.	Industrial construction companies and houses	The best solar energy
MEPhI Ineco	Development and production of filters for water purification for everyday use, industrial purposes or for specific field conditions.	Develop new products. Enter other Russian regions.	Enter CIS countries, then Europe.	Everyday and industrial usage of filters	Quality and price
OKC Service	Internet solutions: Web-design, graphic design, e-commerce, system integration, hosting, corporative mail, audio and video on the Internet, advertising on the Internet, promotional sites, technical maintenance services for subscribers, bookkeeping program 1C: company	Intensive development into the Russian market. Providing qualitative services and service processes Competence of specialists. Client service through Internet technology.	Foreign market entry of the firm's product.	BtoB	Long-term collaboration with customers quality
Quarta-Rad	Produces devices to measure radioactivity	To make products for ecological monitoring that are easy to use.	None, but open for it.	People concerned about their health in all layers of society	Price and does not require knowledge in radioactivity
Teros MEPhI	Zuivering en ontzouting van zeewater op basis van nieuwe technologie.	Receive orders to purify sea water. Attracting more people. More area.	Receive information from countries on water purification.	Water treating	Superiority over all existing technologies

Appendix 11: UT Entrepreneurial support structure

UT Entrepreneurial support structure

Twente university has the following mission statement: 'The University of Twente is an entrepreneurial research university with a focus on technological developments in the knowledge society' (Institute plan 2005-2010, p. 3 in Dervojeda, 2006, p. 26), related to 'converting knowledge into industriousness by boosting entrepreneurship in students and staff' (Dervojeda, 2006, p. 26).

The UT has the highest spin-off ratio in the Netherlands. More than 600 spin-offs and approximately 130 student companies have emerged. These are responsible for over 5000 jobs.

(www.kennispark.nl/overkennispark/Initiatiefnemers/UT.doc/). The goal is to intensify the support structure to become the most entrepreneurial university of Europe. For this, a triple approach will be developed: Converting knowledge into business activities, stimulating entrepreneurship amongst co-workers and students, and the realization of Knowlegde park. This approach indicates that Twente University believes there is more to knowledge valorisation that the creation of spin-offs. New and established firms can use new and existing knowledge from the university. (www.utwente.nl/bcvb/onderzoek/contract-onderzoekenutilisatie/utilisatievanonderzoek/IP-valorisatiedeel.PDF).

At the University of Twente there are many ways in which entrepreneurs are supported. This appendix introduces the most important instruments and programs. The goal is to give a brief overview on aspects that are present at UT to aid spin-offs, not to provide a full analysis of their own capital situation or what exact needs of the firms are fulfilled.

1.1 Entrepreneurship in education

Students at UT become acquainted with entrepreneurship in various ways. Education in this field is executed by NIKOS, which will be introduced in section 1.2. The minor entrepreneurship is offered to bachelor students who are interested in entrepreneurship, either as entrepreneur or as advisor. The program offers a mixture of theory and practice in the areas of marketing, law, management and financial management in SMEs and internal business units. The master Innovation & Entrepreneurship is meant for master students to explore relations between technology, innovation, entrepreneurial processes, and the role of knowledge management, organization and networks. Within this one-year program, students can opt for a specialization in innovation or in entrepreneurship, that can be extended to a two-year program at the University of Aalborg in Denmark. Furthermore, the bachelor program Advanced Technology has integrated entrepreneurship and innovation into its curriculum, in which university-industry-interaction takes a central role. (webhare.axis.nl/kennispark_n/Starten_en_groeien/Studenten/onderwijs.doc/).

1.2 NIKOS

The Dutch Institute for Knowledge Intensive Entrepreneurship combines expertise in education, research and support of entrepreneurship, especially regarding entrepreneurship in networks. Results of research are used for educational programs and support programs like TOP and Kansrijk Eigen Baas (Twente Kennispark, werk maken van kennis). The goal of these programs are to enhance the amount of spin-offs from the university and in the Twente region (www.utwente.nl/niko/bds/). There is also a project called FemStart to 'debate on the importance of female scientists, in relation to the advancement of knowledge intensive entrepreneurship' (www.utwente.nl/niko/bds/femstart.doc/). NIKOS has special interests in development of (starting) knowledge intensive enterprises, strategic, management and entrepreneurial processes in context of technological innovation and international environments, and university-industry-interaction in context of academic entrepreneurship and international environments (www.utwente.nl/nikos/about/mv.doc/2.html).

1.2.1 TOP Program

TOP stands for 'Temporary Entrepreneurial Position', which is a program carried out by NIKOS on behalf of the university (www.utwente.nl/top/general_information/relationship_with_the_university.doc/). Starting entrepreneurs with a clear connection to a department of the university can take part in this full-time program to overcome the first and most difficult year of a new company. Since 1982 more than 400 entrepreneurs have participated of which 75% survived the first five years. 80% of the companies are located in the Twente area and are responsible for over 3000 FTEs. Every year, approximately 100 new jobs are created. The TOP program is responsible for approximately half of the spin offs at the UT.

TOP selection criteria
Entrepreneurial attitude
Motivation, character
Clear view on business concept
Market potential, knowledge based
Establish enterprise in Twente region
Relation with research group
Full-time available to set up business
Business plan: need for TOP loan

Figure 1.1: TOP selection criteria (source: www.utwente.nl/top/information_for_applicants/top_selection_criteria.doc/).

Three kinds of entrepreneurs can apply for the TOP program. These are graduates or post-graduates from the UT, graduates from other universities or higher education institutes, and entrepreneurial persons who would like to develop a product idea with help of the UT. The offer of the new enterprise needs to fit with a research group of the university. Figure 1.1 provides TOP selection criteria. During the TOP year, the entrepreneur can work on technical developments of the product or service, and establishments of organizational structures. Also, special attention is given to commercial aspects and basic financing is arranged. (TOP tijdelijke ondernemers plaatsen voor ondernemers die willen starten vanuit een ondernemende universiteit, Universiteit Twente). This means that they are offered an interest free loan, office space and connection to a research group, but also advice and training in preparing a business plan, management, marketing, and financing strategies. (www.utwente.nl/top/general_information/initiation.doc). There is a scientific mentor and the entrepreneurs can follow the course 'Becoming and entrepreneur' to develop important skills and to write a business plan that should reflect the 'type of company, range of expertise, products and/or services, considerations on the market, pricing strategies, etc. The interest-free loan needs to be paid back within five years, which is a personal loan, so not a loan to the company. It must be understood that the TOP program is adapted to different needs from different entrepreneurs, leading to differences in support offered.
(www.utwente.nl/top/general_information/the_offer.doc)

The concrete support from the TOP program can be summarized as follows:

- Support and practical guidance regarding business administration by an experienced entrepreneur or mentor
- Technical support by experts from the research group
- Support and (midterm) evaluation by the TOP-commission
- A personal loan of 14.500 euro on preferable conditions
- Use of UT network and image
- Possibilities to generate assignments through the UT

It is also possible to use UT facilities such as laboratories and equipment, housing and office facilities for 2.500 euro. (www.utwente.nl/top/general_information/initiation.doc/). This is to keep 'initiation and operating costs as low as possible during the first critical year'
(www.utwente.nl/top/general_information/the_offer.doc/).

To successfully apply for a TOP place, four steps need to be taken. Firstly, there is an intake with the program manager to explore possibilities for a TOP placement. When thought fit, the manager will look for a suitable host in a research group. Secondly, there is an admission procedure. Sessions with the TOP commission discuss the business plan with special attention to marketing and finances. After the meeting a decision is made on whether or not the entrepreneur is granted a place in the TOP program, or if it can participate for three months and has to prove he is suitable to follow the remaining nine months. The third step is mentoring and monitoring. The research group is engaged

in mentoring activities, mostly in an informal manner. The entrepreneur is invited to all research group meetings. TOP also provides business mentors, but it is the responsibility of the entrepreneur himself to contact these mentors and to use them efficiently. After six months, there is a monitoring meeting with the TOP commission to evaluate performances and whether or not targets are met, and why. After this meeting, the entrepreneur needs to create new targets for the second half of the program. The final step is the exit interview. The TOP year is evaluated and there is a discussion on what steps to take next.
(www.utwente.nl/top/general_information/step_by_step_programme_procedures.doc).

During this TOP year, the enterprise is located on the premises of the university. This is to make knowledge of the research groups easily accessible. After this year, they are requested to move elsewhere, preferably the Business and Technology Centre (BTC). When the company has outgrown BTC, they should move to their own locations on the Business & Science Park (www.utwente.nl/top/general_information/initiation.doc/).

1.2.2 Kansrijk Eigen Baas

Kansrijk Eigen Baas is an innovative approach to support and advice people with the ambition of becoming an entrepreneur that has started in 2002. The program is executed by NIKOS, and financed by Rabobank, the European Fund for regional development and municipalities in the North East and North West of the province of Overijssel. The uniqueness lies in the fact that people without an explicit idea for a new company can also participate. Participants are selected according to their ambitions of becoming an entrepreneur. The program offers trainings, coaching, financial support, office space, and a network of 60 colleagues at minimum.

The project is divided into two trajectories. The first trajectory is meant for entrepreneurs with concrete ideas. This is an individual based part time program that lasts one year, in which the entrepreneurs are trained, coached and provided with facilities. The networks of the coaches from the UT and Rabobank, as well as from established entrepreneurs will be used. The second trajectory involves people without a business plan who want to become entrepreneurs. These are people who want to re-enter the work force, are unemployed, or were declared unfit for work. There is a semi-fulltime group program that lasts three months, followed by a part time project of two months. The first stage is the creation of a manageable idea, then a business concept is developed, after which an organization could be established. The trajectory offers an intensive training and coaching program in which participants learn to use and develop their capacities. The group process has a clear added value. Selection, however, is strict. The candidate needs to have a good educational background and good work experience, and needs to possess the necessary entrepreneurial skills. Most firms are clustered around ICT, the biomedical industry, process technologies and, clustered around MESA+ which is explained later, in the nano industry. (Intern NIKOS document, Groen, 2007).

In sum, Kansrijk Eigen baas offers a stimulating environment with 60 other starting entrepreneurs, trainings such as strategy, marketing, financial management, business organization and skills in acquisition, individual coaching, an extensive network from the UT, Rabobank, current and previous participants, the possibility to ask advice on the business plan from experts, and facilities such as office space, telephone and secretarial support. (www.kansrijkeigenbaas.nl)

1.3 Business & Technology Centre.

The business & technology centre (BTC) functions as business incubator for knowledge intensive companies and organizations that are specialized in high-technology or eminent business services. (www.kennispark.nl/Partners/BTC.doc/). The mission is to ‘create an environment for the formation

and survival of new enterprises' where the focus is 'the development of companies'. (R. De Koning, presentation June 2007). Entrepreneurs who have completed the TOP program are requested to establish the firm in BTC. BTC has been responsible for 3.000 eminent jobs in the last twenty years. Only 4% constitutes in business failure. Entrepreneurs can fully concentrate on entrepreneurship and development, whereas the rest is taken care of by BTC. This involves provision of facilities to extended networks from other entrepreneurs in the building, from UT and from Saxion higher educational institutes.

At BTC, office space can be rented from 12 m^2, including parking spaces, furnishing of offices, energy use, telephone answering, mail support and use of conference rooms. This is the basic offering. Additional services can be used against very reasonable prices, such as secretarial support, fax services, financial services and audiovisual aids in conference rooms, and catering. BTC has access to an eminent data network with access points in all offices and the building is suitable for laboratories and production processes.

The services offered by BTC are very flexible, as every entrepreneur can decide for himself what is needed and what is not. This also holds for the office and business spaces, as they can be rented for each m^2 and can be increased or decreased at wish. However, the most important aspect of the business incubator is its network that the entrepreneurs can use. There is a monthly BTC-cafe to meet co-entrepreneurs, and there are regular meetings revolving around current themes. (BTC, bedrijfstechnologisch centrum twente bv, dé vestigingsplaats voor innovatieve ondernemers). Also, the stakeholders have necessary knowledge in diverse areas. These are ABN AMRO Bank, several venture capitalists, the UT, Saxion Institute for Higher Education and Ten Hag Holding, which is a real estate agent.

1.4 Business and Science park

Business and Science park is a business territory for knowledge intensive companies and firms in business services and the UT. BTC is also located on business and science park. When the companies outgrow BTC and do not need additional support anymore, they can find a location on the 40 hectares of Business and Science Park. (www.kennispark.nl/Partners/Businesspark.doc/). In this way, they are fully independent but can still enjoy the benefits of the entrepreneurial environment.

1.5 Knowledge Park

NIKOS and Business and Science park are partners of Knowledge park. The UT, the province of Overijssel and the city council of Enschede want to develop the region into a knowledge intensive crossroad of international level through knowledge transfer to generate new businesses. The goal is to create 10.000 eminent jobs for the region in 2020. (www.kennispark.nl/overkennispark/). The number and size of spin-offs should be stimulated further by active commitment to the start and growth of knowledge intensive enterprises. Also, new and current knowledge is needed to innovate further. Last but not least, the goal is to establish an inspiring establishment climate in which the combination of UT, Business and Science Park and Knowledge park leads to a giant meeting point for entrepreneurs, scientists and students. (www.kennispark.nl/overkennispark/Doelenprogramma/). The knowledge park foundation is responsible for execution of these ambitions in the next four years. (www.kennispark.nl/overkennispark/Organisatie/). Companies can cooperate with research groups, research results are used by start-ups or established companies, and firms use students for graduation assignments. There are research institutes in nanotechnology (Mesa+), information technology and telematics (CTIT), mechatronics (IMPACT), biomedical technology (BMTI) and administration (IGS)(Twente Kennispark, werk maken van kennis). More will be said about Mesa+ in the next section. Knowledge park also includes business accelerators, that operate from the research institutes to market new products in a faster fashion through focused guidance of 'entrepreneurial coworkers' or scouting and screening for companies that can market technological innovations.

(www.utwente.nl/bcvb/onderzoek/contract-onderzoekenutilisatie/utilisatievanonderzoek/IP-valorsatiedeel-PDF). The accelerator selects companies according to their market potential and whether or not Intellectual Property needs to be secured. (www.utnieuws/utwente.nl/new/?artikel_id=10370).

1.5.1 Mesa+

Mesa+ is part of Knowledge park and is located at the campus of Twente University. It is the largest research institute at UT where the goal is to 'excel in its field of science and technology; to educate researchers and designers in this field, and to build up fruitful national and international cooperation with industry and fellow institutes' (Mesa+ jaarverslag 2005, p. 6). Scientists and entrepreneurs share housing, cleanrooms, laboratories and production facilities to jointly start companies in micro and nanotechnology. During 15 years of existence, 33 spin-offs were generated and the first spin-offs from these spin-offs have been established. The young companies can completely focus on their growth, rather than purchasing the right technological equipment. (Twente Kennispark, werk maken van kennis).

1.5.2 Chance zone

Knowledge park was assigned as chance zone by the Dutch Ministry of Economic Affairs. This implies that starting and fast-growing companies can receive coaching and assistance in the areas of subsidies, financing, procedures and rules. (webhare.axis.nl/kennispark_n/Starten_en_groeien/Groeien%20met%20kennis/Kansenzone-1.doc/). The so called formula manager does not solve encountered problems himself, but knows where the companies can go to find the right answer. According to him, 'entrepreneurship is about knowing the right people' (P. Bliek in Patrick Bliek zoek succesformule voor technostarters, Bits&Chips, 2007, p. 70) The formula manager has regular meetings with the Ministry of Economic Affairs and formula managers from Delft and Eindhoven to discuss progress and to explore in what areas regulations could be improved. (Patrick Bliek zoekt succesformule voor technostarters, Bits&Chips, 2007).

1.6 Innovation lab Twente

The newly established innovation lab Twente is meant to generate work from knowledge to enhance economical growth and employment in the region Twente and East Netherlands. It was established to improve internal coordination mechanisms of knowledge valorization activities. 'The purpose is not to centralize them into one unit, but to observe, monitor and manage the activities happening at the decentralized level.' (K. Dervojeda, 2006, p. 32). The institute is engaged with patent matters, further establishment of the campus in relation to business housing and facility sharing, further attempts to construct Knowlegde park, and it is responsible for better links between the research institutes of the UT and the environment. (www.utwente.nl/nieuws/pers/archief/2006/innovationlabtwente.doc/).

Innovation lab is embedded in 3TU Innovation Lab, which includes the individual labs of Twente University, Delft University and Eindhoven University. The aim is to develop one single patent policy, TOP program, etc, for all three universities, so to harmonize 'best practices'. (www.utwente.nl/bcvb/onderzoek/contract-onderzoekenutilisatie/utilisatievanonderzoek/IP-valorisatiedeel.PDF).

1.7 Technology Circle Twente (TKT)

The technology circle Twente is a network organization that was founded by the university of Twente and the business and technology centre. It is a partner of Knowledge park. It is an association of independent knowledge-based companies that are affiliated with the University, meaning that they were established through TOP. (www.utwente.nl/top/general_information/network.doc).

This active network consists of 180 high tech knowledge intensive companies with the aim to cooperate and exchange information. The primary mission is to create better economical chances for TKT members. These members are mainly young technological enterprises with 10-25 employees. They are focussed on new development. However, business service providers, research institutes, educational institutions, governments and regional industries are also members (www.tkt.org).

TKT organizes special meetings that are designed to exchange information and to establish new contacts. Also, knowledge and information is exchanged through its website. TKT organizes and attracts projects to enhance cooperation between members. Also, it is engaged in making members visible to the market, and to support in their business development. (www.kennispark.nl/Partners/TKT.doc/).

TKT especially attempts to enhance cooperation in projects. Several projects have developed. Mindshift, for example, focuses on potential world players that do not have the means and expertise yet. They can benefit from contacts in various disciplines to bring in complementary assets. Another project is Twente Technology Initiative to participate in exhibitions to promote high-tech business in the region. Netlab is engaged in stimulating development and innovation in the field of Care and Technology. Product Factory is meant to stimulate cooperation between TKT companies and healthcare institutions. Other projects are medgame, Mechatronics and BioEnergy cluster. (www.tkt.org).

1.8 Pre-incubator

Although Twente University has a successful spin-off program, the companies remain rather small compared to universities in Leuven and Cambridge, for example. This is partly due to the fact that entrepreneurial teams in Twente are often technologically dominated, leading to a lack of marketing ambitions and different skills in entrepreneurship and management than if the entrepreneurial team were to be more balanced. In the present structure there is no room to support high potential ideas effectively without small companies falling short. The pre-incubator program is yet to be established in collaboration with the higher institute of Saxion and is aimed at stimulating high potential entrepreneurship in the Twente region. Intensive support, training and selection of entrepreneurial teams will lead to stronger growth of the spin-offs from the University of Twente. In the first stage the capacity of the participants to recognize opportunities, to create business concepts and their skills in entrepreneurship are tested and developed. Gradually, the stronger individuals and groups will become apparent and they will be tied to a concrete spin-off idea. From this period, the person who had this idea will also be involved in the spin-off. It is to be expected that from a group of 60 participants 35 ‘normal’ companies will be established and approximately five high potential companies. This enhancement in high potential entrepreneurship will attract (foreign) investors, also for other elements in entrepreneurship structure at the university. (Intern NIKOS document, Groen, 2007).

1.9 Conclusion

Twente university is a truly entrepreneurial university in the sense that everything is directed towards knowledge valorisation. The mission of the university to convert knowledge into industriousness by boosting entrepreneurship in students and staff does not only include the establishment of new spin-offs, but also how existing companies can use research results from the UT.

NIKOS is responsible for many entrepreneurial support activities. Firstly, if offers education in entrepreneurship. But the most important instruments are the TOP program to overcome the first difficult year, and KEB in which group processes have a clear added value to entrepreneurial initiatives and developments. The Business and Technology centre support developing companies

through coaching, courses, facilities and networks. Business and Science park is the location of knowledge intensive companies that have become too big for the Business and Technology centre. Knowledge park is a partner. The goal is to use knowledge park to create 10.000 jobs in 2020 and to create a giant meeting point for entrepreneurs, scientists and students. MESA+ is part of knowledge park, as are four other research institutes. MESA+ has a business accelerator to scout and screen for high market potential, and to provide focused guidance accordingly. Knowledge park is also assigned as chance zone, to help companies to find their way in the web of regulations, subsidies, finances and procedures, and to detect areas in which these need to be altered. Furthermore, the Innovation lab Twente is meant to observe, monitor and manage the activities of the university regarding entrepreneurial support. It is part of 3TU, where the aim is to harmonize the best practices of the three Dutch technical universities with each other. Twente University stresses the importance of good networks. This was already seen in KEB, but the other instruments also greatly facilitate networking. Technology Circle Twente is another instrument that can be used. It is a network of 180 firms with the aim of cooperation and exchanging information. Despite all efforts, UT finds that there is not enough support for high potential companies. In the current system, they cannot receive adequate support without harming the smaller companies. Therefore, there are intentions to create a pre-incubator for this target group.

It could be said that one cannot look at the previous mentioned instruments in isolation. They are aspects of a program that need to be combined to gain a clear grasp of the entrepreneurial support structure of the university. Spin-offs can make use of different aids in their different stages of development.

The support structure of the UT comprises all dimensions of the 4S model. Figure 1.2 shows a model that is regularly used at NIKOS to clarify this. The scope dimension is facilitated by a strategic coach that helps starting or nascent entrepreneurs with the creation and formulation of ideas, and how these ideas can be converted into a business plan. The scale dimension is facilitated through loans without rent. In the skills & values dimension, the participants of the support programs can make use of knowledge that is developed at the UT and they receive organizational support. Lastly, the university acts as a broker to establish and develop the networks of the entrepreneurs.

Support instruments at the University of Twente

Figure 1.1: Support instruments at the University of Twente (Entrepreneurial support at the university of Twente: Acceleration of Regional Economic Growth. Groen)